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DEPARTMENT OF THE ARMY
(U.S. ARMY CONCEPT TEAM IN VIETNAM)
APO San Francisco 96384

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FINAL REPORT

VEHICLE CONVOY OPERATIONS IN THE REPUBLIC OF VIETNAM

ACTIV PROJECT No. ACG-78F

UNCLASSIFIED

Approved: 30 SEP 1971

David H. Thomas

DAVID H. THOMAS
Colonel, ADA
Commanding

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SUBJECT: Final Report - Vehicle Convoy Operations in the Republic of Vietnam (ACTIV Project No. ACG-78F)

DA, Headquarters, U.S. Army Vietnam, APO San Francisco 96375 JAN 29 1972

THRU: Commander-in-Chief, US Army Pacific, APO San Francisco 96558

TO: Assistant Chief of Staff for Force Development, Department of the Army, Washington, D.C. 20310

1. Subject final report is submitted for review and approval.

2. This headquarters concurs in the conclusions and recommendations as written.

3. Request one copy of all forwarding and approval indorsements be furnished this headquarters.

FOR THE COMMANDER:

F. L. HONSOWETZ
CPT. AGC.
Assistant Adjutant General

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AUTHORITY

Letter, Office of the Assistant Chief of Staff for Force Development, Department of the Army, 9 April 1970, subject: Army Combat Development and Materiel Evaluation (CD&ME) Program, Vietnam FY 71 (U).

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1st Australian Task Force
1st Aviation Brigade
18th Military Police Brigade
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US Army Support Command, Da Nang
US Army Support Command, Qui Nhon
US Army Support Command, Saigon

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(U) ABSTRACT

An evaluation of vehicle convoy operations in the Republic of Vietnam (RVN) was conducted by the Army Concept Team in Vietnam during the period December 1970 through March 1971. The purpose of this evaluation was to study and analyze the organization and procedures employed in vehicle convoy operations by the US Army in the Republic of Vietnam and to determine whether or not applicable doctrine was being followed. Conclusions drawn from this evaluation were that: (1) transportation units did not possess the capability to perform proper vehicle maintenance and to meet convoy requirements; (2) transportation units did not have adequate organic security vehicles; (3) land clearing, road paving, and aviation support provided effective means of countering the ambush threat; (4) personnel and equipment losses due to mines posed a major problem; (5) in general, applicable doctrine was followed. ACTIV recommends that : (1) the vehicle maintenance capability of transportation units involved with convoy operations be strengthened; (2) an armored car, or like vehicle, with multiple weapons systems, be developed specifically to provide convoy security, and that it be organic to units concerned.

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cc. MACV Directive 381-2, Volunteer Informant Program, December 1969.

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ee. 'Report 'of the Army Scientific Advisory Panel' Ad Hoc Committee for Mine Detection-Neutralization (U), undated. (SECRET)

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2. (U) BACKGROUND

a. General

During conventional wars, such as World War II and the Korean War, the vast majority of US Army convoy operations were conducted behind friendly lines which afforded relative safety fron attack by enemy ground forces (direct, sabotage and ambush), aircraft, and indirect fire. In the stability operations being conducted in the Republic of Vietnam (RVN) during this evaluation, the enemy moved throughout the countryside. Depending upon his objective, the terrain, and his logistical capability, the enemy was capable of conducting both standoff attacks and ambushes on any convoy.

b. Convoy Operations

Support commands of the United States Army, Vietnam (USARV) provided support for more than a million men dispersed over m area of 66,000 square miles. To distribute these supplies various nodes of transportation were used. Airlift was generally employed for emergency and priority movement of limited quantities of supplies. Rail or canal networks were available only in certain areas and thus were limited in use. Motor transport was the primary means of moving cargo to receiving units. The importance of motor transport in RVN prompted this evaluation (reference a).

c. Countering the Road Mine Threat

Study of countermine activities on RVN roads was also included in the evaluation or convoy operations, as approved in references b & c. Security of lines of communication (LOC) was of prime importance to convoys for successful accomplishment of their missions. A major threat to LOC's was the enemy's employment of mines to reduce or prevent traffic flow. This economy-of-force tactic had necessitated an extensive effort to open and maintain the security of the LOC's. Studies such as the SECMA Report (reference dd) and the American Scientific Advisory Panel Study (reference ee) did not provide data in sufficient detail to enable differentiation between personnel losses due to mines on roads versus those off roads.

3. (U) DESCRIPTION

a. Convoy Operations

(1) AR 310-25 defines a motor convoy as "two or more vehicles under single control, with or without escort, used in the transportation of military personnel or materiel." Convoy operations were conducted throughout RVN, primarily for movement of supplies and equipment from posts and depots to support units. Each of the four major support commands had organic motor vehicle transportation units to move cargo to supported units/areas.

(2) Coordination and prior planning played an essential role in convoy operations. This was particularly true for nondivisional convoys because these usually required the combined resources of three or more commands, namely, the support command and the involved military police brigade, as well 3s the tactical command through whose area of operations (AO) the convoy passed. In order to be effective, cargo movements had to be scheduled in such a manner that supplies and equipnent were assured of reaching the proper destination within thk alloted time. The determination of convoy schedules, size, composition, routes and destinations was a planning and coordinating function exercised by appropriate units of the support command. Divisional convoys, however, were under the control of only the division commander.

(3) The protection and security provided to a convoy was determined based upon such factors as the current enemy situation, the type of supplies being moved, the terrain, and the availability of security resources. Nondivisional convoys depended on US, Republic of Vietnam Armed Forces (RVNAF) or Free World Military Assistance Forces (FWMAF) infantry, aircraft, mechanized or armored elements for additional protection while en route; divisional convoys were provided security from divisional resources. Any convoy operating within the division AO was placed under a central division controller, who tailored the size aiid composition of the sdditional security elements for each convoy, based on the above fzctors. This security included tactical elements, artillery and aviation support, and outposts along the road. Minimum security measures normally consisted of the transportation unit's command and control vehicles, armed with machineguns. Military police units reinforced this security, as required, with XM706 (V-100) armored cars and 1/4-ton trucks configured as gun-jeeps with mounted machineguns.

(4) The four USARV support commands (Da Nang, Cam Ranh Bay, Qui Nhon, and Saigon) were responsible for the receipt, handling, storage, and distribution of all supplies and equipment'used by US Forces in RVN and a portion of those items used by RVNAF and FWMAF.

b. Road Mining and Countermine Procedures

The enemy frequently employed mines to interdict the flow of both military and civilian traffic. Road-clearing operations were often conducted as a countermeasure. Road-clearing operations usually consisted of road sweeps for mines, generally performed by Engineer units. Most of the LOC's did not require clearing due to paving and heavy civilian traffic. Conversely, the roads in the forward areas which were generally not paved and had little or no civilian traffic required daily sweeps if they were to be used for military traffic. During Operation LAMSON 719, January through April 1971, Highway QL-9 was the only road where convoy operations and road-clearing operations were observed being conducted simultaneously (reference map, Annex H-1).

4. (U) PURPCSE

The purpose of this evaluation was to study and analyze the organization and procedures employed in vehicle convoy operations by the US Army in the Republic of Vietnam and to determine whether or not applicable doctrine was being followed.

5. (U) **OBJECTIVES**

a. Objective 1 - Describe the missions assigned to major logistical support convoys and determine historical trends.

b. Objective 2 - Determine trends in the nature and level of the enemy threat.

c. Objective 3 - Evaluate convoy planning, conposition, end configuration.

d. Objective 4 - Evaluate convoy command and control procedures.

e. Objective 5 - Evaluate tactics and techniques in convoy security,

f. Objective 6 - Document enemy road mining tactics and describe and analyze procedures and equipment used in countering this threat.

g. Objective 7 - Analyze the findings of Objectives 3 through 6 and compere them with existing doctrihe to determine adequacy and relevancy of current Army doctrine.

6. (U) **SCOPE**

a. **General**

(1) The US Army transportation units included in the study were those assigned to major support commands and responsible for conducting a large volume of convoys in support of major logistical complexes, and a few selected divisional transportation units with large-scale convoy missions. In addition, pertinent supporting units (i.e., military police, engineer, and aviation) were studied. Figure I-1 shows both the total number and types of units available for survey. The numbers of units available represent those units which were most likely to be tasked to conduct or to support convoy operations; this represents 100 percent of the units that were available for this evalution. The missions of these units, pertaining to convoy support, were generally well established from past experience. Other units appeared to have a capability to support convoys but had never been tasked to do so and were therefore not considered in this survey.

UNITS AVAILABLE FOR EVALUATION 2/

UNITS 1/	FUNCTION	NUMBER
Support Commands	Received the requirement for supplies to be issued.	4
Transportation Truck Units	Actively participated in the movement of supplies.	37
Engineer Units	Responsible for opening and maintaining the LOC's in a secure state.	30
Military Police Units	Provided security to the transportation convoys.	15
Army Aviation Units	Provided aviation support to convoys.	55
Tactical Commands	Responsible for added security in their area of operation (AO)	7

NOTES: 1/ The term "UNIT" is used to represent agencies, headquarters, companies, and detachments.

2/ See Annex G for the specific units which were surveyed.

FIGURE I-1 (U). Units Surveyed.

(2) The accomplishment of Objective 1 was limited, because not all the desired data could be obtained. Records maintained at the office of the Deputy-Chief of Staff for Logistics (DCSLOG), USARV, provided data only on gross tonnages shipped in RVN, by mode of transport (highways, water, rail). These data were not broken down by class of cargo, number of vehicles, or by support command. An extensive review of Operational Reports-Lessons Learned, on file in the Office of the USMV Command Historian, and of records maintained by the various support commands and by the Assistant Chief of Staff for Logistics, Military Assistance Command, Vietnam (MACVJ-4), did not provide the necessary information.

(3) Sufficient data also were not available in a usable form for the accomplishent of objective 2. In attempting to determine trends in the nature and level of enemy threat, the evaluators discovered that accurate and consistent records on incidents involving convoys nad not been maintained over an extended period. A weekly DCSLOG report concerning route security classification and incidents on the LOC's provided the most pertinent information available; however, the data covered only the period June 1970 through March 1971. Also, the data made no distinction between sniper attacks end ambushes (in many cases all that was indicated was that there was an incident involving an attack by fire), and interviews with unit commanders and other personnel revealed that not all incidents had been reported, and that some reports were not accurate. AII additional limitation was that a number of the personnel interviewed had to relate their experiences from previous tours in RVN, due to the lack of enemy activity affecting convoys during the tine of the evduation. This limited data and other information collected on the nature of enemy threat has been incorprated in other sections of the report.

b. Convoy Operations

The project officer and evaluators spent 394 man-days in the field in support of the data collection effort. Evaluators rode 60 convoys (Including one Army of the Republic of Vietnam (ARVN) convoy and one US Marine convoy) an amassed over 7,000 man-miles while traveling with these convoys. Additionally, Australian Fcrces personnel were interviewed regarding their convoy operztions.

(2) The evaluation did not address those convoy operations or tactical motor marches conducted by units in moving their own supplies or equipment.

c. Rosd Clearing Operations

Road-clearing operations, which usually consisted of road sweeps for mines, were generally performed by engineer units. Evaluators participated in nine deliberate mine sweeps, covering a distance of over 60 miles and requiring 40 hours of search time. Evaluators spent four man-days

with the US Marines and three man-days with the Australian Forces to review their countermine procedures. Most of the LOC's did not require any clearing due to their paving and heavy civilian traffic. Conversely, the roads in the forward areas which were generally not paved and had little or no civilian traffic required daily sweeps if they were to be used for military traffic. Because of this varied environment, many engineer units had no requirement to sweep roads. Other obstacles to traffic were not found, hence road sweeps were the only road clearing operztions observed in this evaluation.

7. (U) METHOD OF EVALUATION

a. General

The procedures used for this evaluation included gathering of information through questionnaires, interviews, and research of unit records pertaining to vehicle convoy operations. A preponderance of the material in the report was derived fron observations and informal discussions as indicated below.

b. Convoy Operations

(1) Three officer evaluators represented the branches (Infantry, Military Police, Transportation) that predominate in the convoy operations. Two cf the evaluators had been military police or transportation company commanders, while the third had been a MACV district advisor to a Vietnamese district chief. This third evaluator spoke Vietnamese, which proved to be a great asset in dealing with Vietnamese civiiians and ARVN soldiers. Three NCO evaluators were also assigned. All personnel, except one officer, had had previous combat experience.

(2) Evaluators documented, in detail, 15 of the 60 convoys which they accompanied. They attended prebriefings given by the transportation battalion S-3 on the night prior to the convoy's departure, participated in all aspects *of* the convoy operation, attended the convoy debriefing, interviewed convoy participants, and completed detailed after-action reports. While on convoys, the evaluators observed ambushes, participated in fire fights, rode all the major convoy routes in Vietnam, and rode in all of the various elements of the convoy. The evaluators maintained notes on the status of all activities, including maintenance, driver performance, and training. The evaluators lived and rode with the various convoy personnel, from truck drivers to convoy commanders. The above conditions were conducive to gathering and validating information through observation and informal discussions. The evaluators compared their professional judgements and observations on the convoy operations in which they participated with reports of documented convoy operations (ORLL's, after-action reports) and the preponderanca of opinion of unit commanders and other personnel interviewed.

c. **Road** Clearing Operations

(1) Two engineer evaluators conducted the **survey** of road-clearing operations. Both evaluators had previous combat experience, **and** the officer had experience as an engineer company commander in combat.

(2) Evaluators documented nine road-sweep operations and visited 30 units which conducted such operations. The evaluators attended briefings and debriefings at **all** levels of command, participated in **actual** sweep operations, interviewed sweep-team personnel, **and** completed detailed zfter-action reports. The evaluators observed the detection of mines and boobytraps and the surrender of two armed Hoi Chanhs.1/ The evaluators lived with the engineer units under conditions which permitted the gathering and validating of information through observation and informal discussions. Countermine procedures were evaluated according to tne capabilities of units performing their designated functions to counter a particular enemy threat. Their effectiveness **was** determined Cy: demonstrations of countermine procedures; documentation of countermine procedures; preponderance of opinion of personnel familiar with nine employment; and the **professional** judgement **of** the evaluators.

8. (U) ENVIRONMENT

a. All support commands except the Saigon Support Command **had** installations predominantly in the eastern coastal plain of RVN in Military Regions (MR's) 1 and 2. Saigon Support Command facilities were situated **largely** on the Mekong Terrace of MR 3; however, the command supported units in **both** MR 3 **and** MR 4. The evaluation took place during the northeast mon**soon,** when parts of RVN received from one to ten incnes of rain monthly **and** others received less than one inch. The units in MR 1 and the northern part of MR 2 lie within the area **receiving** tne heavier rainfall. Differences in topography acd **rainfall** had some effect on certain aspects of convoy operations and were taken into consideration in interpreting the results of the study.

b. During calendar year 1970, enemy activity against **convoys** hed **been** generally limited to sniper fire which caused little or no damage. The only exceptions were deliberate ambushes by the enemy in the Mang Giang **pass** and An Khe pass on highway QL-19 (see **map** Annex H-1); there, ambushes occurred with some regularity. Evaluatcrs were able to observe convoy operations under heightened and protracted enemy activity during operation LAMSON 719. **Also** during LAMSON 719, some of the roads on which the con**voys** moved were narrow dirt roads which were not cleared on either side. These convoys were continually subjected to ambush **and** mining incidents.

c. **The** following constraints were placed on **vehicle** convoy operations by the environment of RVN:

1/ Hoi Chanhs are NVA/VC who **rally** to the side of the government of **Vietnam** under the Chieu Hoi **(Open** Arms) Program.

(1) Movement of US convoys throughout RVN was subject to civilian traffic regulations. Coordination with civil authorities was therefore necessary to obtain proper clearance before motor movements were executed. The uncontrolled flow of civilian traffic posed additional problems when convoys became interspersed with civilian vehicles, making command and control difficult to maintain.

(2) Although a majority of the main LOC's in RVN were paved or were in the process of being paved, the condition of many of the roads imposed restriction on the movement of large military convoys. Common restrictions were narrow roads, one-way bridges, numerous ferry crossings, and heavy dust.

(3) The enemy was capable of ambushing convoys in alnost any area of RVN. This threat was particularly serious in mountainous or remote areas, especially in the northern regions of the country. Mining on main LOC's was somewhat less of a threat, although still a significant factor on unpaved roads.

(4) Convoy operations were largely confined to daylight hours, that is, convoys departed the point of origin after daybreak and arrived at either their final or intermediate destination before darkness.

(5) Since motor transportation units had only a limited capability to provide convoy security measures, they relied upon support commands and tactical units to secure the road net and to provide convoy protection from hostile action.

9. (U) DATA COLLECTION

The following sources provided the data base for this study:

a. Records of:

(1) Assistant Chief of Staff for Logistics, Military Assistance Command, Vietnam (MACV-J4)

(2) Deputy Chief of Staff for Personnel and Administration, United States Army, Vietnam (DCSP&A, USARV)

(3) Deputy Chief of Staff for Operations, United States Army, Vietnam (DCSOPS, USARV)

(4) Deputy Chief of Staff for Logistics, United States Army, Vietnam (DCSLOG, USARV)

(5) Cam Ranh Bay, Da Nang, Qui Nhon, and Saigon Support Commands

(6) Mine Warfare Center, USA Engineer Command, Vietnam, (USAECV), (MWC)

(7) Inventory Control Center, Vietnam (ICCV).

b. Intelligence data from MACV-J2; Combined Intelligence Center, Vietnam (CICV); and Combined Materiel Exploitation Center (CMEC).

c. Operational Report–Lessons Learned obtained from USA Combat Developments Command and from within USARV.

d. Historical documents from the files of the Command Historian, USARV, and throughout the several commands of USARV.

e. Doctrinal publications provided by USA Combat Developments Command (see reference to field manual publications).

f. Senior Officer Debriefing Reports.

g. Unit after-action reports and SOP'S.

h. Structured interviews, questionnaires, and discussicns. (See Figure 1-2 for list of questionnaires, interviews, and the number of personnel completing each.),

i. In addition to the other sources of information which were used for this study, the following items were used as indicated:

(1) Convoy Operations

a. Records of military police and transportation units, as they applied to the study.

b. Evaluator after-action reports of 15 convoys.

c. Evaluator observations of convoy operations, including Operation LAMSON 719.

(2) Road Clearing Operations

a. Records of engineer units as they applied to the study.

b. Evaluator after-action reports of nine road sweeps.

c. Evaluator observation's of road-clearing operations, including Operation LAMSON 719, during which evaluators accompanied the initial road sweeps to the Laotian border.

QUESTIONNAIRES	NUMBER OF PERSONNEL
1. DCSLOG/MACV-J4	3
2. Support Commands	3
3. Convoy Commanders	26
4. Convoy Personrel (drivers)	85
5. Security Force Commanders	10
6. Security Force Personnel'	23
7. Transportation Units	25
8. Military Police Units	11
9. Aviation Units	55
10. Engineer. Units	34
11. Sweep Teams	41
12. Personnel involved with operation of the expendable mine roller (ENSURE 202)	5
	321

INTERVIEWS	NUMBER OF PERSONNEL
DCSLOG	4
Provost Marshals	9
MACV Traffic Management Agency Officials	3
Transportation Unit Commanders	1
	17

FIGURE 1-2 (U). Number of Personnel Who Completed Questionnaires and Interviews4

SECTION III

CONCLUSIONS AND RECOMMENDATIONS

1. DCI CONCLUSIONS: Rased upon the findings in this report, it *is* concluded that:

a. Transportation units involved in convoy operations did net possess the capability to nerform proper vehicle maintenance and at the same time meat the *convoy* requirements placed upon them.

b. Transportation units involved in *convoy* operations did not have adequate organic security vehicles (e.g., armored cars) to provide protection for their convoys.

c. Land clearing along LOC's, road paving, and aviation support were the most effective means available for countering the ambush thrrrt to convoys.

d. Personnel and equipment losses due to mines posed a major problem during stability operations.

e. In general, doctrine dealing with convey operations was followed.

2. DCI RECOMMENDATIONS: . It is recommended thatr

a. The vehicle maintenance capability of units operating convoys be strengthened.

b. *hn* armored car, or like vehicle, vith multiple weapons systems, be developed specifically to provide convoy security, and be made organic to units concerned,

SECTION II

DISCUSSION AND FINDINGS

1. (C) OBJECTIVE 1 - MISSIONS ASSIGNED TO MAJOR LOGISTICAL SUPPORT CONVOYS AND HISTORICAL TRENDS

a. General

In early 1965 US forces had many obstacles to overcome in building a transportation system capable of supporting the large-scale movement of men and materiel. RVN was an underdeveloped nation with a primitive transportation network. Monsoon floods and enemy interdiction had destroyed 75 percent of RVN's existing rail network. There were two major aerial ports, at Da Nang and at Saigon. There were many airfields; however, these were scattered throughout the country, were unimproved, and had limited ground control and navigation aids. Intra-country water transportation was restricted to canals and small river networks of the Mekong Delta; vessels on these waterways were continually subject to enemy attack. The coastal waters, while relatively secure, were not conducive to rapid movement of supplies. Highways were two-lane, hard-surfaced roads. Secondary roads were unimproved dirt roads which, during the monsoon season, failed under heavy traffic. Saigon was the only deep-water port in RVN. This caused a critical situation because ninety percent of all cargo brought into RVN came by deep-draft vessel. In 1965, cargo began to move into RVN at an accelerated rate (see Figure II-1). In mid-1965 an intensive port-development program was begun at Da Nang, Qui Nhon, Saigon, and Cam Ranh Bay, and a project of upgrading RVN highways and secondary roads began on a large scale. US military and contractor truck convoys began to fill the roads. Under the guidance of the United States Agency for International Development (USAID) and the MACV Joint Coordinating Committee, the rail system was improved. During 1965-1969 the tonnage of military *cargo* hauled by rail steadily increased. Airfields and airports were improved and additional airfields were constructed (paragraph I-1, reference z).

b. Theater Requirements

(1) Theater requirements for supply were generated and satisfied by Military StandardRequisition and Issue Procedures (MILSTRIP). Supplies were moved into theater in accordance with Military Standard Transportation and Movement Procedures (MILSTAMP). The interface between these two systems is shown in Figure II-2.

(2) The Traffic Management Agency, Military Assistance Command, Vietnam (TMA, MACV) was responsible for monitoring and controlling transportation assets theater-wide. It accomplished that mission through TMA regional field offices located throughout RVN. TMA was ultimately responsible for the decision on whether *cargo* moved by highway, rail, water or

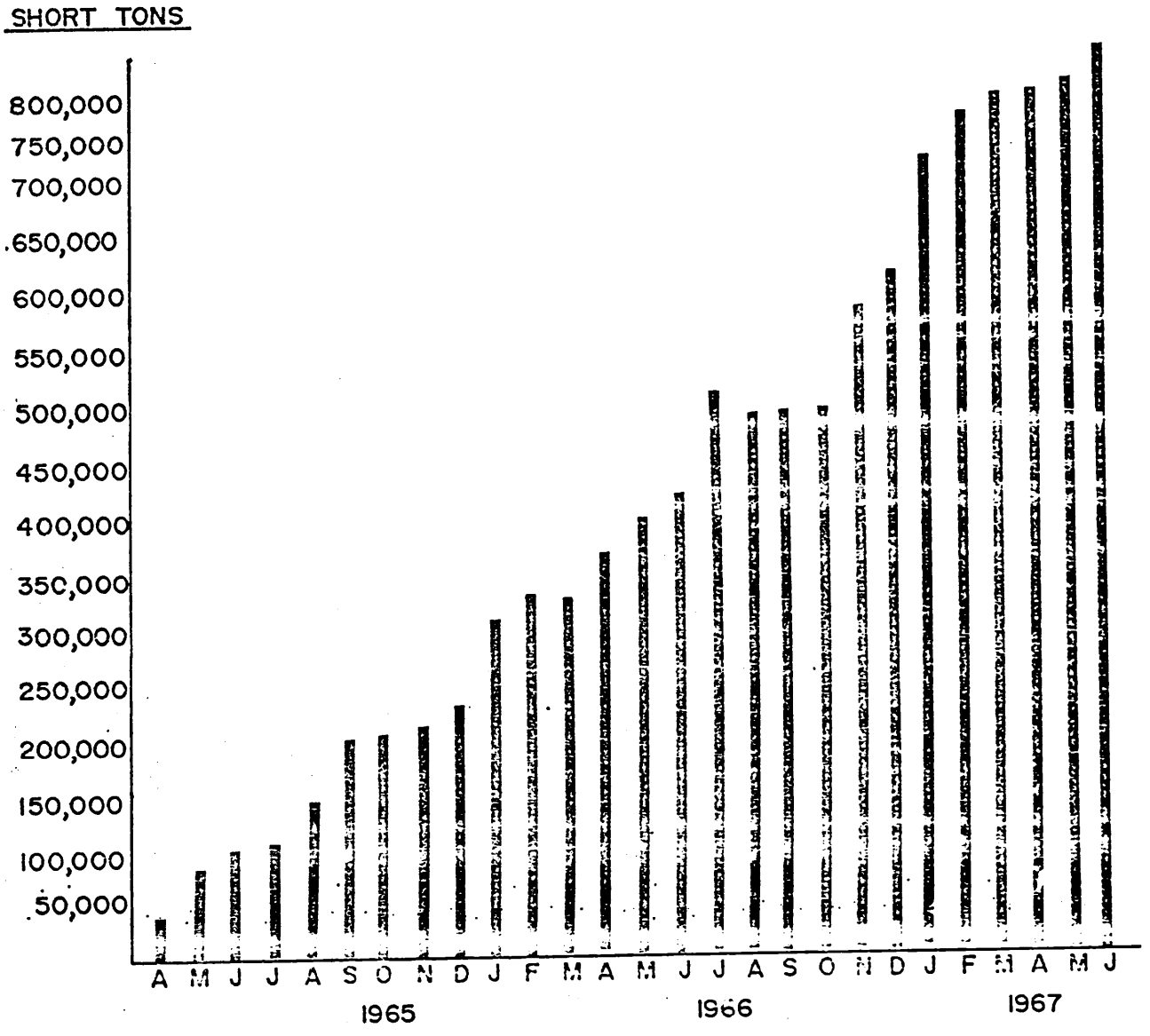

FIGURE II-1 (U) Tonnage Performance (U).

SOURCE: The Logistics Review, USARV, 1965-1969

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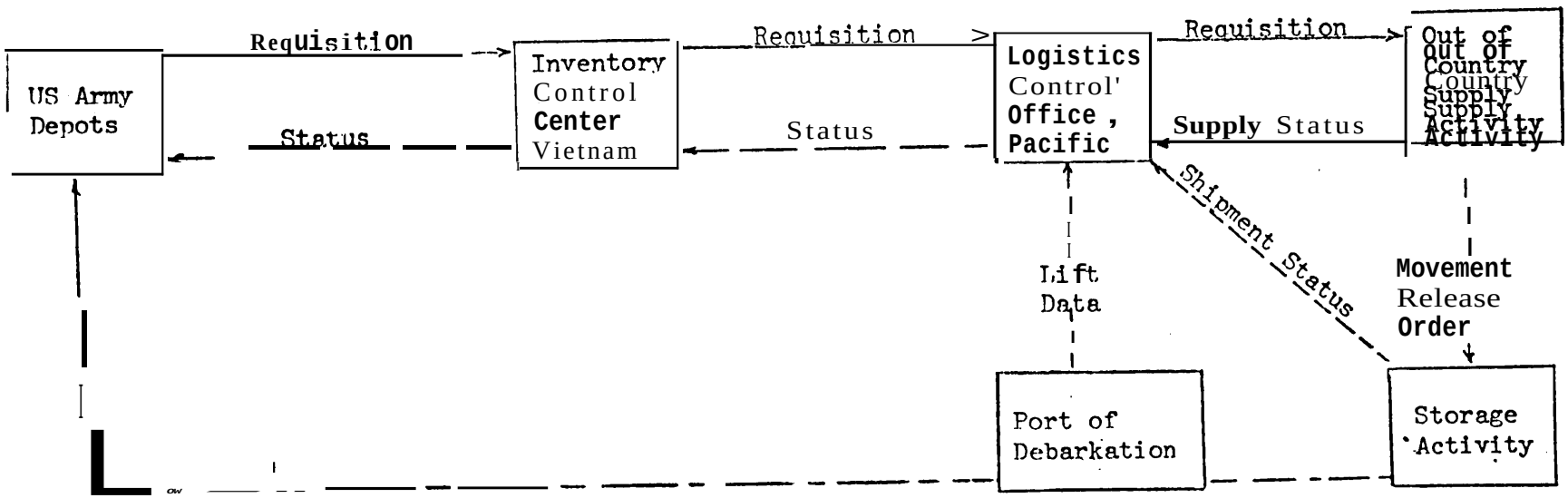
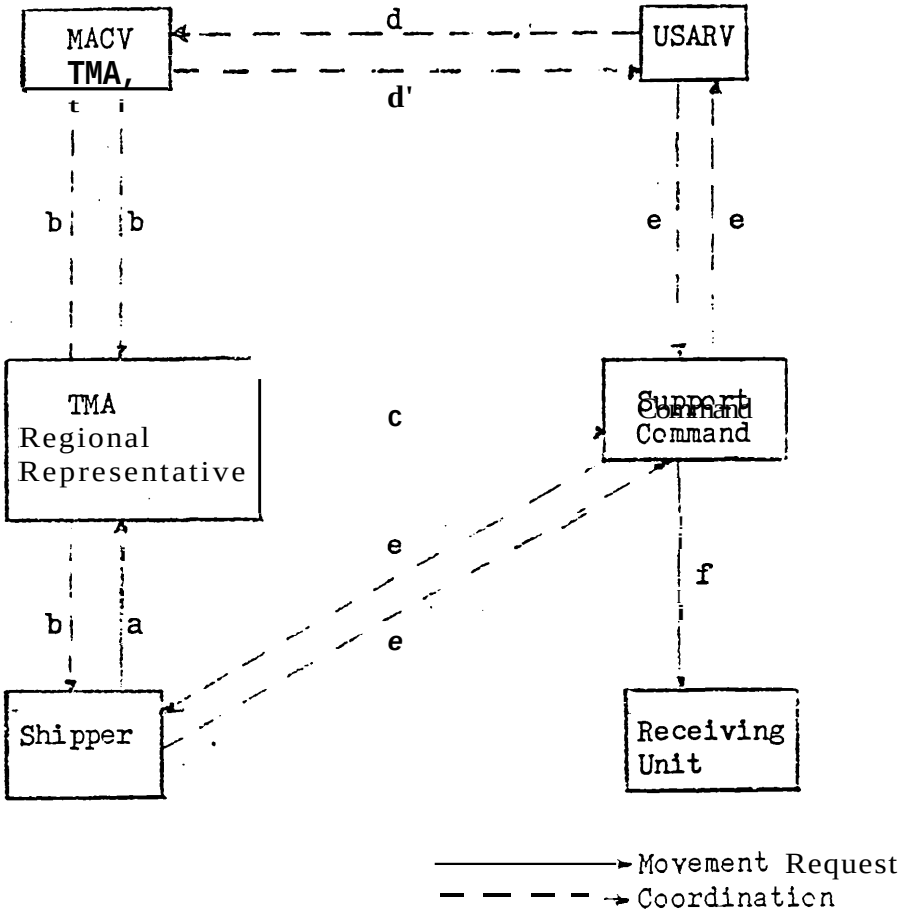


Source: DCSLOG, USARV

FIGURE II-2 (U). MILSTRIP/MILSTAMP **Interface** System.

air. Figure II-3 shows the coordination required for freight movement on RVN highways.



Events depicted in this figure occur in the following sequence:

a. A shipper (any agency that has cargo to be shipped) sends a movement request to the TMA regional representative at the particular field office.

b. The TMA regional representative coordinates movement request with TMA Headquarters and the shipper.

c. The TMA regional representative forwards the movement request to the appropriate Support Command, and TMA Headquarters and USARV coordinate.

d. TMA Headquarters coordinates request with USARV.

e. The support command coordinates with USARV and the shipper.

f. The support comnand ships the cargo to the receiving unit.

FIGURE II-3 (U). Coordination Required for Freight Movement on RVN Highways.

(3) The missions of TMA MACV can be best shown by extract from the TMA MACV Mission Letter (paragraph I-1, reference ff) (this information was current for the time period of the evaluation):

"The following missions *are* assigned to your unit:

1. Direct, control and supervise all functions incident to the efficient; and economical use of freight and passenger transportation services required for movement of all DOD sponsored personnel and cargo.

2. Serve as a point of contact for all users of military highway, railway, inland waterway, cosstwise, and troop carrier and cargo airlift transportation capability as made available by the component commanders; arrange for movement; advise and assist shippers and receivers to insure that such transport capability is effectively utilized. ...

The Traffic Management Agency, MACV, performs assigned mission under the operational control of COMUSMACV with staff supervision exercised by J-4 MACV. The Agency commander, in discharging assigned functions, is authorized direct communication with component commands, their units, installations, and activities on technical matters described below:

1. Requirements for transportation resources.

2. Traffic management and related services provided by the agency.

3. Use of military owned transportation resources."

c. Convoy Missions/Classification

(1) The mission statement for the convoy was given to the convoy commander. The preponderence of mission statements were given orally, but some were written. In the fifteen briefings in which evaluators participated, the mission statement was essentially the same, i.e., to operate a convoy from one point to another. Mission statements were often shortened *to* the destination name for purposes of referring to a given convoy. An example of this was the convoy conducted between Long Binh and Cam Ranh Bay in October 1970, which was more commonly referred to *as* the "Cam Ranh Bay Convoy." All support commands used this method of description.

(2) On eight of the convoys in which evaluators participated, an attempt was made to classify the missions of convoys by the classes of supply transported. Difficulty wes encountered in this method of classification, since the classes of supply were mixed - not only within convoys, but even on the same truck - and in many cases the contents of the load were not described well enough to classify the item. Consequently, this method of classification was discontinued.

(3) All surveyed transportation units classified their convoy operations based on distance traveled. (The longest convoy in which evaluators participated was a convoy fron Cam Ranh Bay to Ban Me Thout, a one-way distance of 142 miles). FM 101-10-1 (reference y) classifies convoys as "line haul" or "local haul". There are several rules of thumb for determining line-haul versus local-haul operations, as follows:

(a) Line hauls are characterized by long transit time in relation to loading and unloading time. Line hauls normally involve one trip or a portion of a trip per day.

(b) Local hauls are characterized by short transit time in relation to loading and unloading time. Local hauls normally involve a number of trips per day.

(c) The support commands used one additional factor to determine line haul versus local haul; generally, if a convoy could return the same day it departed, it was considered a "local haul". If the convoy had to remain overnight (RON) at its destination, it was considered a line haul.

d. Trends

(1) Figure II-4 shows RVN highway tonnages frcm December 1967 to July 1969 and from January 1970 to March 1971. During the Tet offensive of 1968 and its aftermath, highway tonnages ranged froa an all-time low of 394,000 short tons in February 1968 to an all-time high or' 832,000 short tons in June 1968. The period July 1968 through April 1970 showed an overall decline in highway tonnages. During the Cambodian offensive, tonnages rose from 624,000 short tons in May 1970 to 719,000 short tons in June 1970. Tonnage for 1970 reached its monthly peak in September (747,000 short tons; and deciined in subsequent months to a level or' 410,000 short tons in January 1971. One reason for the sharp decline was USARV's objective to decrease heavy reliance on highways and achieve a better mode balance in intra-RVN shipments. Tonnage for January 1971 was the lowest since the beginning of Tet 1968. During Operation LAMSON 719 (January - March 1971) highway tonnages increased from 410,000 short tons to 448,000 short tons.

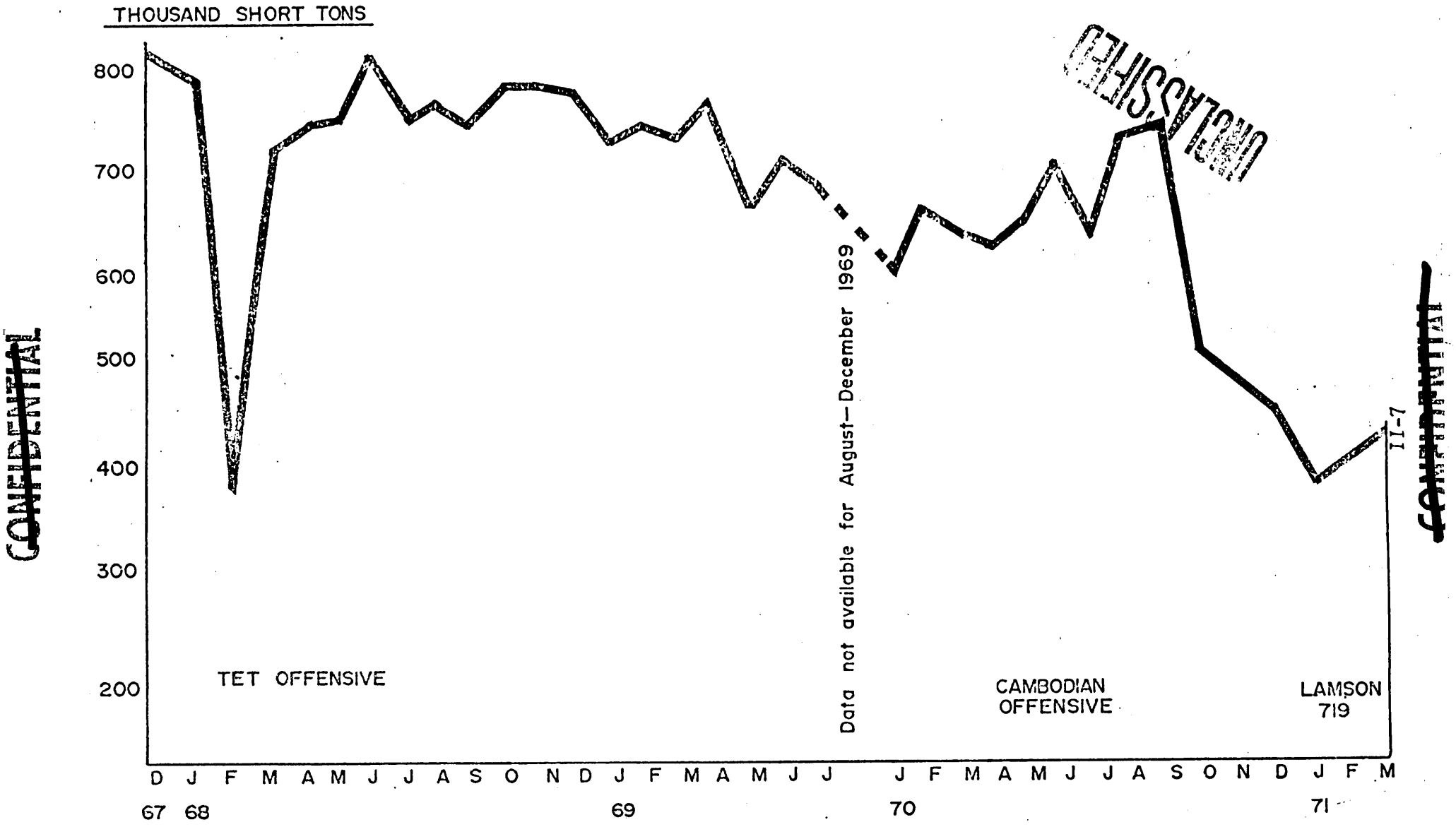


FIGURE II-4 (C). Highway Tonnages December 1967-March 1971 (U).

(2) Figure II-5 shows the comparative performance of all modes of transportation for the calendar year 1970.

MODE	TONNAGE	PERCENT
Highway	7,667,000	82
Water	949,000	10
Rail	451,000	5
Air	318,000	3
TOTAL	9,385,000	

Source: USARV/ODCSLOG

FIGURE II-5 (C). Comparative Performance of All Modes of Transportation for 1970. (U)

e. Findings 1/

(1) Theater requirements for supply were generated and satisfied by MILSTRIP [1b(1); p. II-1].

(2) Supplies were moved into theater in accordance with MILSTAMP [1b(1); p. II-1].

(3) Theater requirements for transportation were monitored and controlled by the Traffic Management Agency, MACV [1b(2); p. II-1].

(4) Missions assigned to major logistical support convoys were described in a mission statement given to the convoy commander, by the destination of the convoy, by the classes of supply hauled by the convoy, and by the distance the convoy traveled [1c; p. II-5].

(5) During 1970 highway transportation accounted for 82 percent of the total tonnage shipped [1d(2); Fig. II-5, p. II-8].

2. OBJECTIVE 2 - TRENDS IN THE NATURE AND LEVEL OF THE ENEMY THREAT.

Adequate reliable data were not available to make a determination of trends in the nature and level of the enemy threat directed against convoys. Therefore, objective 2 was not accomplished, and pertinent data which could be validated was incorporated into other appropriate portions of the study.

1/ Numbers in parenthesis refer to the paragraphs of the report which support each finding.

3. (C) OBJECTIVE 3 - CONVOY PLANNING, COMPOSITION AND CONFIGUPATION

a, General

The organization of a convoy required three basic steps. Planning factors were considered before any convoy was formed. After the basic planning, the composition or content of the convoy was determined and the configuration, or arrangement of the various elements, established.

b. Planning Factors

(1) Convoy Mission Requirements and Priorities

Cargo was moved from the ports and beaches to depots and then to the individual units for use. The assets for moving cargo were limited; therefore, some types of cargo took precedence over other cargo for movement. A system of priorities was established to govern transportation assets and their use.

(a) Methods of Priority Establishment

1. At the time of the evaluation, there were two methods of establishing movement priorities in Vietnam. In the Da Nang and Saigon Support Commands, the establishment of priorities was accomplished at support command Movement Control Centers (MCC's). The priorities were established as a direct result of the request submitted by the unit in its original supply action. The initial priority submitted by the unit was balanced against transportation assets under the control of the TMA and MCC, and the movement priority was then determined by MCC.

2. A new system, initiated 1 January 1971 by the Qui Nhon and Can Ranh Bay Support Commands, eliminated MCC and combined its responsibilities with TMA, MACV. This was done to provide a central clearing house for all modes of transportation and to streamline movement of all cargo via common-user transportation assets. Under this system, the shippers (i.e., the depots) forwarded their shipping requirements to the TMA. The requirement was submitted as an information packet which described the cargo according to size, weight, destination, suggested mode and priority. The priority system used in the movement of supplies was outlined in detail in the TMA, MACV Integrated Priority System. This priority system listed 43 transportation priorities which were established based on the types of cargo. These priorities accounted for all classes of supplies and generally gave priority to combat-essential supplies, while "nice to have" items received the lower priorities. TMA compared the transportation movement requirements to the transportation assets on hand and established a final priority for the movement of the cargo to the using unit. The shipper was then advised of the mode of delivery and time of the shipment. This system was scheduled to be instituted in

Saigon Support Command in June - July 1971 period. Conversion of Da Nang Support Command was to be determined later, pending changes in the tactical situation in MR 1.

(2) Frequency/Scheduling

Convoys were classified as either "scheduled" or "unscheduled". Scheduled convoys were those which ran on a recurring basis, while unscheduled convoys were run on a one-time basis.. Transportation unit respondents (10) were asked if there were any differences in planning scheduled convoys versus unscheduled convoys. All perscnncl stated thzt there was no difference. Of the convoys in which evaluators participated, only one was of the unscheduled type. No differences in planning were noted.

(3) Intelligence

(a) General

Twenty-five transportation commanders or their operations personnel were interviewed regarding the use of intelligence as a planning factor. Units which had encountered little or no problem in their daily operation generally did not refer to intelligence sources in planning. Consequently, some respondents did not answer all questions. Con-Joy commanders were generally found to be the persons most knowledgeable on intelligence information, Some commanders stated that intelligence played a very small part in their daily operations, since the convoy schedules were rather rigid and the convoys moved regardless of the intelligence information available at organization level.

(b) Friendly

Twelve of the 18 respondents indicated that knowledge of friendly units could be beneficial. Sore of the reasons given were *that* friendly units could provide support in case of ambush or incident, could act as radio relays, and could augment tne security available to the convoy. Six respondents did not consider friendly units applicable as a planning factor.

(c) Enemy

Five of the 22 personnel (23 percent) interviewed considered intelligence of enemy units not applicable as a planning factor. The remaining 77 percent indicated that knowledge of enemy units facilitated decision-making on the Dart of the convoy commander, and extra security could be provided when enemy activity increased and patterns of enemy activity became apparent. For example, one respondent said that convoys in which he participated were regularly ambushed between the 17th and 22nd of each month; another replied that, in his experience, the enemy struck mostly at night, and therefore he expressed an opinion that night convoys should be eliminated.

(d) Weather (Climate)

Forty-nine percent of the personnel interviewed considered climate not applicable as a planning factor. The remaining 51 percent generally commented upon climate as a factor as follows: air cover for tho convoy was limited by inclenent weather; rain made some roads almost impassible; bad weather required added wrecker support; allowances had to be made for changes in roed condition (dust, mud) because these changes affected travel time; monsoon rains and muddy roads could prohibit the use of trailers.

(e) Road (Terrain)

Forty percent of the personnel interviewed considered terrain and road intelligence not applicable as a planning factor. The others provided the following comments on terrain and road intelligence: if terrain and roads were bad, the heaviest loads were usually put in the front portion of the convoy; guides were needed for critical areas; one-lane roads could prevent gun-trucks (hardened vehicles with various weapon systems added as active protection) from reaching the ambush site; bad roads could require more than one wrecker; bad roads in very mountainous terrain prohibited the use of stake and platform (S and P) trailers.

(4) Coordination

(a) Agencies Involved in Coordination

The planning of any convoy operation required coordination with other agencies which were directly involved in the movement of the convoy. The engineers, military police, aviation, artillery and tactical ground forces played various roles in assuring the safe passage of any convoy. Throughout the evaluation it was difficult to obtain information on the specific coordination which took place. Each of the above agencies performed their assigned tasks as a routine procedure without any specific request for assistance being issued, and the convoy personnel seldom knew exactly who would support the convoy until they met at the appointed time and place. Many convoys relied on fragmentary oral information that "the road was clear," that "artillery was available," or that "aircraft were on call," without ever really knowing whether it was an established fact for their specific convoy. Although formal coordination was lacking, the mission was accomplished as outlined below.

(b) Agencies Responsible for Road Clearing

Although the majority of the LOC's required little or no clearing, some of the roads in forward areas had to be cleared for possible emplaced mines and boobytraps before a convoy could travel the route. The engineer units in each area in which the convoy was to be operating were notified of the convoy's exact route and time schedule,

because not all. roads were cleared on a daily basis unless required. This coordination was performed between TMA and engineer operztions staff at brigade level. Interviews showed that none of the convoy commanders had first-hznd information as to who had cleared the road, when it had been cleared, or other similar data. In fact, most indicated having no knowledge of whether the road actually had been cleared. Much of the convoy commander's apparent lack of concern stemmed from the fact.that they were, operating scheduled convoys over improved routes.

(5) Agencies Responsible for Security and Fire Support

(a) In the early stages of convoy planning, aviation support was provided in the form of convoy route reconnaissance, which for the purpose of this study is defined as that reconnaissance which was conducted for convoy planning purposes, as opposed to :overhead convoy control and security. Approximately 36 percent of the aviation units surveyed ~ r o - vided convoy route reconnaissance on an average of eight times per month. Most of these missions were performed by the Reconnaissance Airplane Company which used the O-1 airplane (see Figure II-6). Usually route reconnaissance for convoys was accomplished in conjunction with area reconnaissance, not necessarily based on specific requests in support of convoys. Aviation support was requested, through channels, from the senior headquarters controlling the aviation assets. Aviation support requests (in the case of two-thirds of the aviation units receiving support command requests) were processed by field force or equivalent headquarters. Forty-three percent of the aviation units receiving mission requests stated that the requests 'required additional coordination, an2 eighty-ttro percent of the aviation units indicated receiving the mission requests 12 hours or less before mission time. Nevertheless, most of the aviation units indicated that they were able to meet the mission, due to the then-current stability'of the tactical situation.

'(b) 'The military police had two roles, convoy security and convoy control. Convoy security roles varied from area to area. In Military Regions 3 and 4, it was observed that the MP's provided the primary convoy security, and extensive prior coordination between MP and TC units was observed hy evaluators. In Military Regions 1 and 2 it was found that MP's supplemented the transportation unit's security measures, using the M706, V-100 armored car, gun-jeep, and/or armored personnel carriers (APC's).

(c) In almost all areas the tactical units provided a re- action force for use in case of a large ambush against a convoy. The reaction force was normally composed of infantry troops which, on occasion, were ready for immediate deployment in transportation provided by the tactical commander. At other times, and depending upon the situation, the troops were only on a standby status. On occasion the troops were pre- positioned in the area of potential need, thereby edding to the security of the convoy. Transportation unit personnel reported that tactical unit escort by FWMAF was not readily available for convoys passing through the FWMAF AO and therefore was not used extensively.

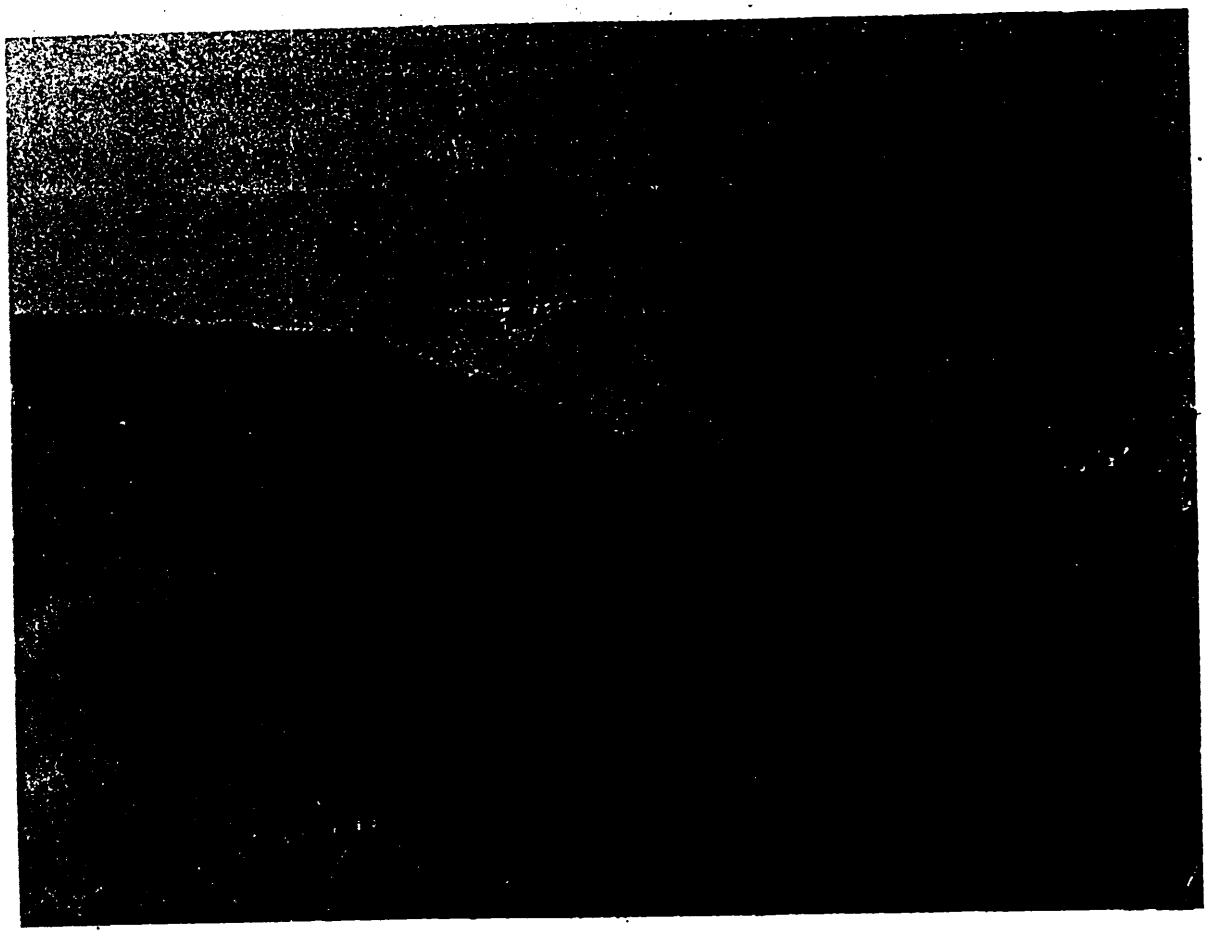


FIGURE II-6 (U). O-1 Airplane Route Reconnaissance.

(d) In a few areas, preplanned artillery fires were available. Generally the request for artillery was placed by the pilot of the supporting aircraft. Although a few convoy commanders had been trained at one time in requesting and adjusting artillery fire, they indicated that they would be reluctant to take this responsibility because of their lack of recent experience.

(6) Requirements to be Coordinated

(a) Route Security Classification

A route security classification was determined by the level of enemy threat, according to the codes established by FM 19-50 (paragraph I-1, reference 1), as shown in Figure II-7. In MR 1 route classifications were made by XXIV Corps; in MR 2, by I Field Force, Vietnam (IFFV); in MR 3, by II Field Force, Vietnam (IIFFV); and in MR 4 classifications were made by the Delta Military Assistance Command (DMAC).

ROUTE SECURITY CLASSIFICATION	
GREEN	Segment of Line of Communication (LOC) between two points is physically open. Control of surrounding area is such that traffic can move during daylight hours, with relative freedom from enemy sabotage, attacks, or harrassment.
AMBER	Segment of LOC between two points is physically open. Security of surrounding area is such that thorough security measures, including armed escorts, are required, and that frequent incidents may occur.
RED	A segment of LOC between two points is closed by enemy control or by extensive physical interdiction. It requires tactical operations and/or engineering efforts to open and/or restore for traffic.

FIGURE II-7 (U). Route Security Classification (U).

(b) Convoy Road Clearance

In order for most convoys to move from one point to another, MCC granted a road clearance as outlined in FM 55-10 (see paragraph I-1, reference v). Clearances were determined for a set route and a set time, to include start point (SP) and release point (RP). Convoys included in this evaluation were planned around these clearances. MCC was the primary agency for controlling road space to prevent road conflicts in

critical areas (i.e., intersections, cities, and dangerous areas). MCC assigned road clearances (priorities on road use) according to the set priority of the type of cargo being moved.

(c) Logistics

Logistics support for the surveyed convoys included such factors as POL support, mess support, and evacuation of equipment Logistics support was primarily the responsibility of the convoy's parent unit. Most convoys furnished their own maintenance/recovery capability and fed their own personnel (C rations). In all but a few cases, personnel were required to sleep in or under their vehicles; overnight facilities such as billets, showers. and latrines were seldom available. When POL was not carried on the convoy, vehicles were refueled at their destination, prior to return.

(d) Type, Availability, and Condition of Equipment

1. There were two basic types of vehicles available for convoy operations - tactical and commercial. Tactical vehicles are those designed and built to US military specifications for on-road/off-road capability. The basic tactical vehicles for most transportation truck units in RVN were the five-ton cargo truck and the five-ton tractor truck. Examples of tactical vehicles are shown in Figure II-8. Commercial vehicles are those designed and manufactured for civilian and commerical use and available through US commercial outlets: e.g., Ford, International, Kenworth, and White. Examples of commercial vehicles are shown in Figure II-9. There were many commercial vehicles in use in RVN. A few military transportation truck units had a substantial number, but none used them exclusively. Commercial vehicles were used by contract-haul companies such as the Han Jin Company, a Korean contract company which hauled cargo from the port of Qui Nhon, and Peril, Ltd., from Newport (Saigon) to Long Binh. These companies often moved over LOC's in convoys secured by gun-trucks of their own design or by US Army security vehicles [see paragraph II-3c(3)(b) for a description and pictures of gun-trucks]. Information provided by Headquarters, USARV transportation personnel showed that it was cheaper to contract for port and beach clearance and some line-haul requirements with commerical agencies than it was to depend entirely on military personnel end equipment. These comercial concerns, under their contracts, provided their own vehicles, maintenance, maintenance floats, and personnel.

2. Military tractor trucks were also used to pull comercial trailers moving cargo throughout the Republic. Foremost Dairies, Meadow Gold Company, Sea/Land, and other commercial firms had commercial trailers such as Highway, Fruehauf, Great Dane, and Kentucky, which were pulled from depot/port to using units by military tractor trucks. Trmsportation and support commands worked closely and harmoniously

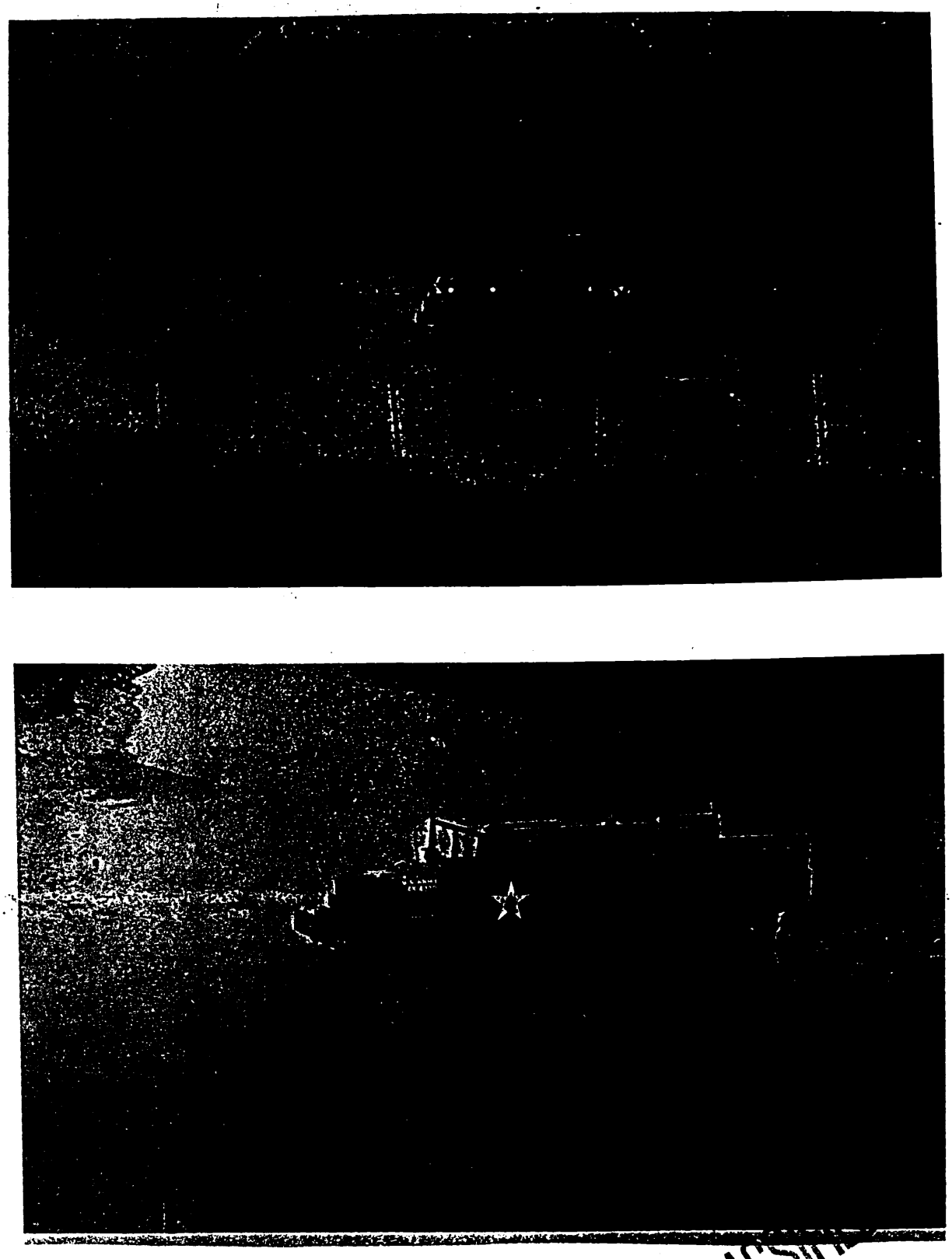


FIGURE II-8 (U). Tactical Vehic

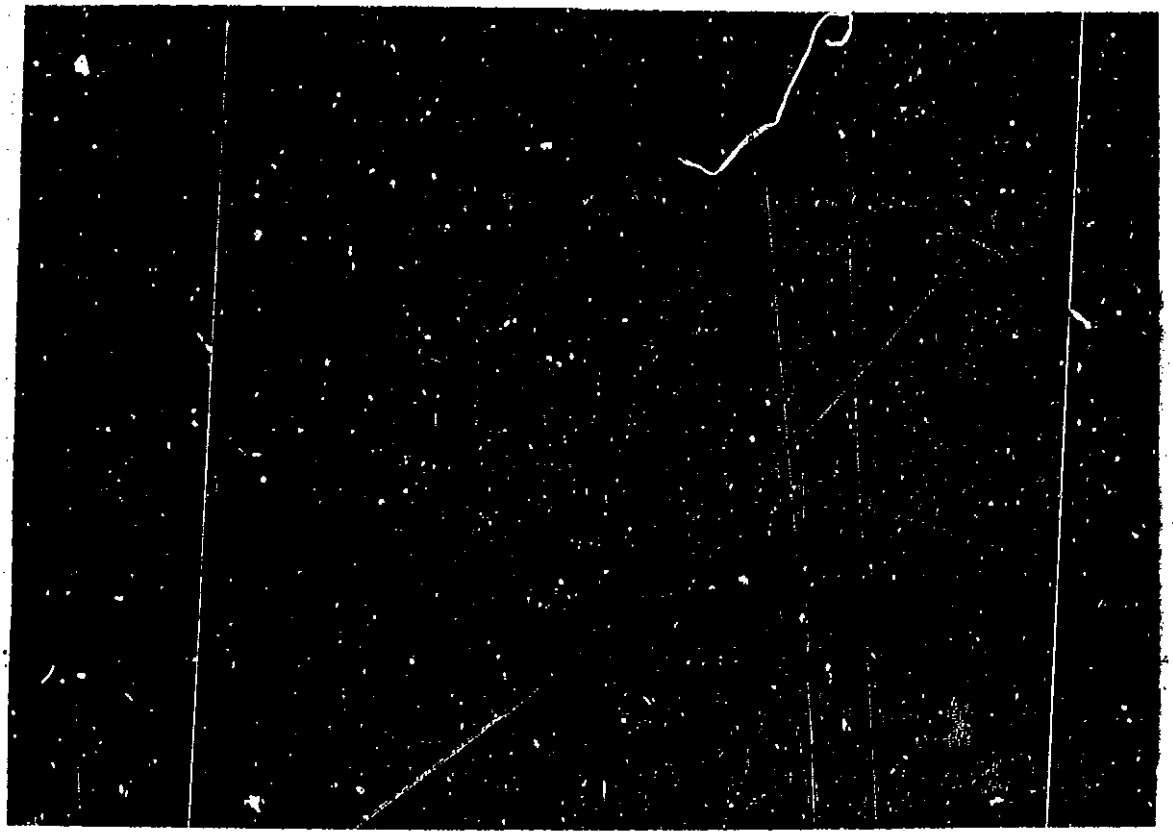


FIGURE II-9 (U). Commercial Vehicles.

with these civilian firms. Support command personnel stated that the primary disadvantage of commercial equipment was its relative lack of ruggedness and consequent incapability to operate on a sustained basis over substandard LOC's throughout the interior regions of the Republic. Although commercial equipment was considered superior to tactical vehicles in terms of economy and driver comfort, most drivers interviewed indicated a preference for the basic 5-ton tactical vehicle over the commercial vehicle, primarily because of road conditions they normally encountered.

3. The basic military vehicles were often modified for safety and comfort. For example, the US Marines installed an anti-fragmentation cab kit to protect personnel from injury by mines. This kit on numerous occasions prevented deaths from 40- to 60-pound mines. 1st Marine Division personnel stated that in the first three-month period that the kit had been in use, no fatalities had been recorded, compared to the average of one fatality per week prior to the installation of the kit. Figure II-10 shows the damage sustained by one of these vehicles without loss of life. Several safety and comfort improvements were recommended by convoy personnel, including roll-bar protection for the cab, standard armor plating for the cab, a better cab ventilation system to filter out heavy road dust, better tires and a better driver's seat. Many drivers stated that the driver's seat in the 5-ton truck was extremely uncomfortable, that its construction (a thin pad over a hard frame) caused backache and induced fatigue. This was particularly true for line-haul drivers operating either over rough roads or when their vehicles were only lightly loaded. (The medical aspects of the standard driver's seat in the 5-ton truck are discussed in Annex D.) A hydraulically dampened driver's seat, standard for 10-ton trucks, had been installed on some 5-ton trucks and met the requirement for an improved seat.

4. The condition of military equipment was generally found to be poor. Drivers stated that they performed daily maintenance on their trucks; however, the evaluators observed very little constructive effort by the drivers being directed toward maintenance of their vehicles while on the road or in POL locations. Support command personnel stated that the tractors were driven on line-haul convoys during the day and that at night other drivers used the same tractors to pull loaded trailers for the next day's convoys. During informal discussions, two battalion commanders stated that higher headquarters had placed too much emphasis on having a high availability rate (over 90 percent) for a sustained period and that this had been at the expense of proper maintenance. Availability rates were subsequently reduced to 75 percent, which permitted a more effective maintenance program. Evaluators observed maintenance problems throughout RVN on virtually all convoys accompanied. Vehicles without headlights were frequently dispatched on convoys scheduled to be on the road after dark. Vehicles with inoperative brakes were also dispatched. One such truck was involved in an accident which caused extensive damage to two vehicles because the driver was unable to stop. Trailers were generally found to be in poor condition, with considerable damage to

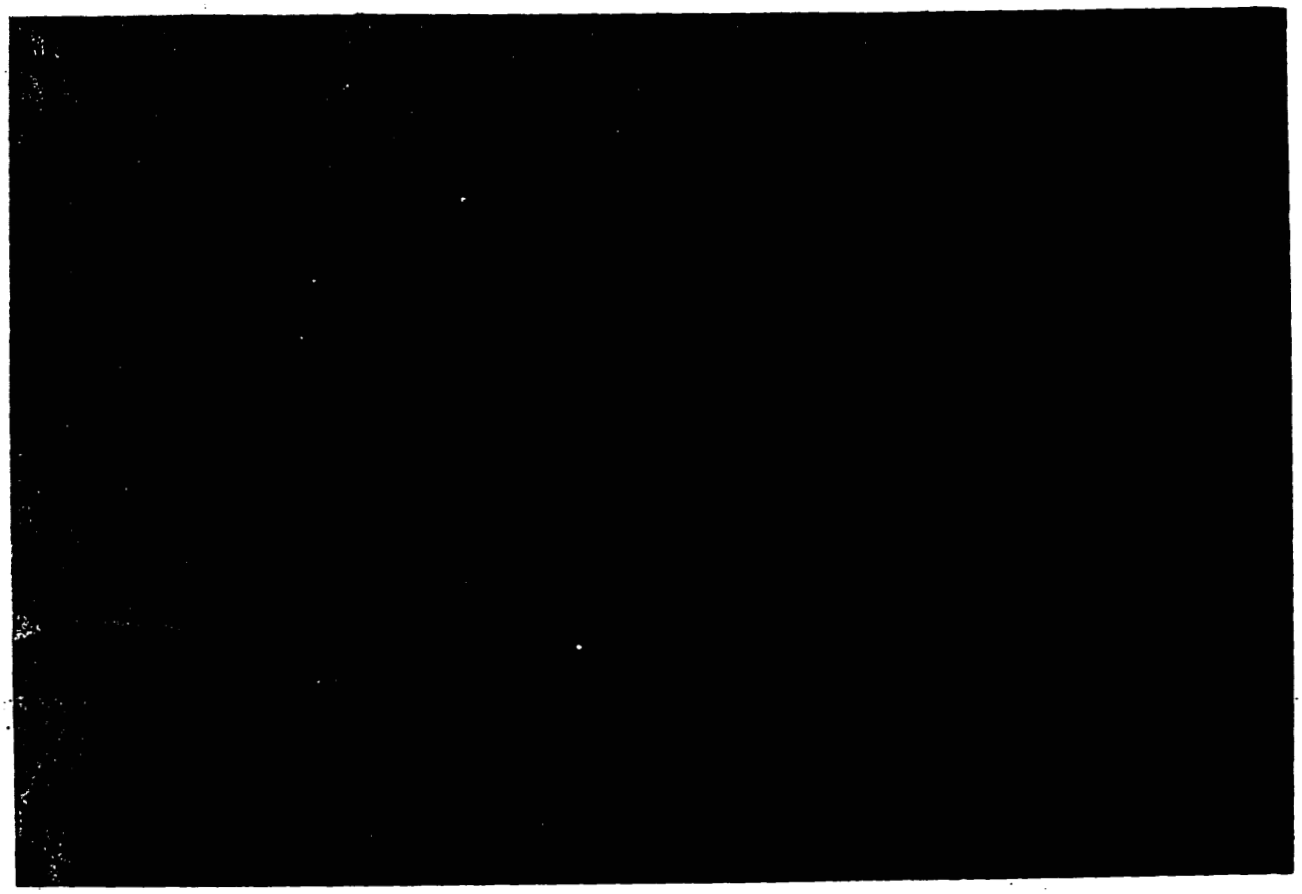


FIGURE II-10 (U). Mine-damaged Truck.

landing legs, lack of side boards, side rails damaged or missing, lack of tail lights, air couplings broken off, flat tires, rotten flooring, and/or lack of grease and other proper servicing. In one notable exception, one company commander attributed his unit's excellent maintenance record to the policy of keeping one driver assigned to each tractor-trailer rig.

c. Convoy Composition and Configuration

Convoy composition refers to the makeup of each of the various elements composing a convoy. Configuration is the arrangement of these elements within the convoy.

(1) Transport Element

The transport element of a convoy is the section consisting of the cargo vehicles, primarily 5-ton tractor trucks with 12-ton S&P trailers. A combination of 5-ton cargo trucks and commercial vehicles was used less often. The transport elements of convoys averaged 28 vehicles, although some had as high as 300 vehicles.

(2) Convoy Logistics Elements

(a) Convoy logistics elements consist of maintenance vehicles, evacuation vehicles, POL trucks, and alternate prime movers referred to as "bobtails" (5-ton tractors without trailers). Convoy logistics elements were located to the rear of the main body [see paragraph II-3c(5)(b) for a description of the main body], and together with security vehicles, were collectively termed the "trail party."

(b) Maintenance vehicles within the trail party consisted of 5-ton cargo trucks which carried spare tires. The only evacuation capability found in convoys was the military 5-ton wrecker and the standard vehicle tow bar. USARV transportation personnel stated that there was a shortage of evacuation equipment in most transportation units, and that it was impossible to have a wrecker in each convoy. Even when alternate prime movers or wreckers were available there was a critical shortage of tow bars within transportation units. Every transportation unit interviewed stated that this shortage of tow bars was a continuing problem. A medium-truck transportation company is authorized two tow bars, both of which are on the wrecker. Transportation personnel stated that the tow bars were not of good quality and broke easily, but it was not determined whether Equipment Improvement Recommendations (EIR) had been submitted. These same personnel stated that supply issues of that particular item were unsatisfactory. One NCO on a battalion staff stated that the tow bar was the most difficult item to receive through normal supply channels.

(c) Occasionally POL trucks were included in the trail party. The distance between origin and destination in most cases did not necessitate carrying organic POL support; most refueling was accomplished at the destination before the return trip.

(d) Alternate prime movers (bobtails) were included in most convoy trail parties, to replace any tractor that became disabled. The bobtail sometimes pulled only the involved trailer, and at other times was needed to pull both the disabled tractor and its load. Transportation personnel stated that a ratio of one bobtail for each five task vehicles was ideal, but that they generally could not realize this ratio.

(3) Security Elements

(a) General

Security elements were either organic to the transportation unit or were provided by other sources; i.e., Military Police or tactical commands (see paragraph II-3b(5)(a)2).

(b) Transportation Elements

Security was provided in many forms. The only organic security vehicles in the transportation units were improvised from organic tactical vehicles. The most common of these was the 5-ton gun-truck which was a basic 5-ton cargo truck modified for protection and fire power. An example of a gun-truck is shown in Figure II-11.

1. The most common protection used on the gun-trucks was 3/4-inch armor plating mounted as side panels. The sides were dual-walled in some cases, filled with various materials such as sand, old mattresses, or wood. The plating offered inadequate protection against rocket-propelled grenades (RPG's); therefore, the various fillers had been devised in an effort to prevent the spray of molten metal resulting from penetrations by RPG rounds. None of these materials were called upon to prove their effectiveness during the evaluation period; however, wood when used to line the interior was said to be effective in stopping the ricochet of armor-piercing rounds and of fragments resulting from the penetration of RPG rounds. The side plating was mounted vertically on almost all gun-trucks observed, which increased its vulnerability to penetration by RPG rounds.

2. Another method of armor plating a cargo truck was to strip an M113 APC body and mount it in the bed of the truck. This was a rapid modification, but offered less protection than did the steel plate construction. The weight of the APC body and its position in the truck bed also resulted in raising the truck's center of gravity, which reduced its maneuverability.

3. Another variety of modified organic vehicle was the 3/4-ton armored gun-truck. Some convoy commanders considered it a good control vehicle. However, due to the limited load-carrying capability of the basic 3/4-ton cargo truck, only a thin plate of armor could be used. Convoy commanders reported that single-plate armor offered protection only

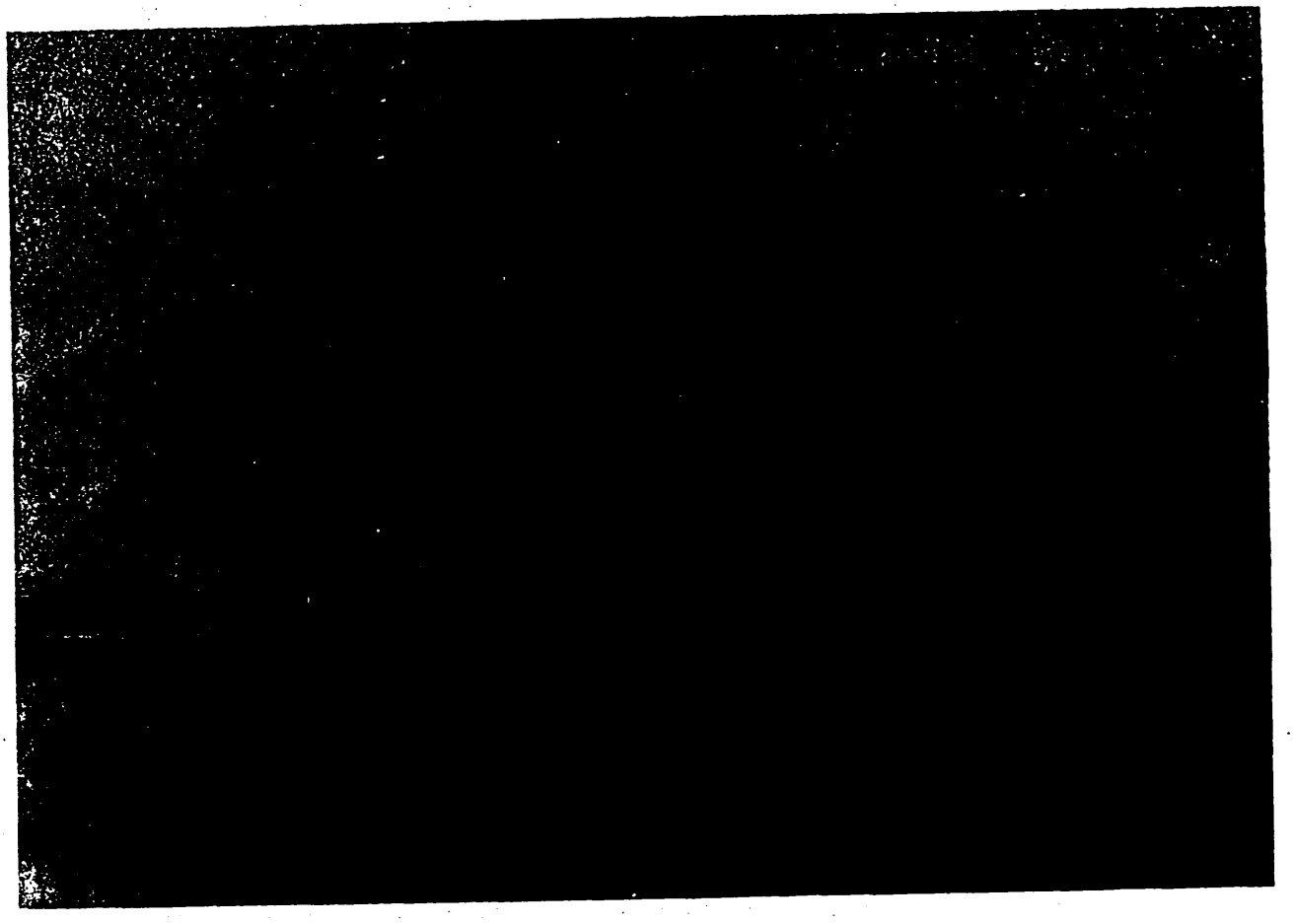


FIGURE **11-11 (U).** Gun–truck.

from small arms fire and some automatic weapons fire. Units that utilized the 3/4-ton Fun-truck stated that the added weight of single-plate armor created a considerable amount of wear and tear on the body and frame of the vehicle.

4. Gun-jeeps were used in Military Regions 3 and 4. This was the basic M151 1/4-ton truck with a single M60 machinegun on a pedestal mount. It offered no protection from enemy fire; its main advantage was in its maneuverability.

5. For cab protection steel plates were placed in the doors, extending over part of the window opening. Some vehicles also had steel plating placed in front of the windshield, hinged to be raised or lowered.

6. Mining of convoy routes did not pose a sufficient threat to warrant units' improving the floor protection of their vehicles. (On 5-ton gun-trucks a layer of boxed machinegun ammunition was stored on the floor for convenience of handling during an engagement. There were no incidents noted or reported to evaluators regarding the hazard potential existing with this method of storage.) US Marine Corps trucks were exposed to extensive mining in their AO, and were provided an anti-fragmentation cab kit which decreased casualty rates.

7. Weapon systems varied, depending on availability and the initiative of the unit. Weapon systems included two to four .50-caliber machineguns, two to four M60 machineguns, and, in several instances, an M-134, 7.62mm mini-gun. Individual weapons and the M79 grenade launcher were also carried.

8. The crew consisted of three or four men, one of whom was designated NCOIC. Convoy personnel considered the gun-truck a strong deterrent to enemy activity and effective for defense in the event of actual ambush. However, observation showed that the gun-truck had many shortcomings. For example, the amount of installed armor plating made the truck top-heavy, and it was also too heavy for some roads. Inadequate means of communication within the gun-truck was an additional deficiency, as was the poor design of armor plating, which was conducive to deadly ricochets.

(b) Military Police Elements

Military police normally used the XM-706, V-100 armored car for convoy security. The XM-706 had proven to be effective, but interviews with transportation and MP personnel indicated that use of these vehicles was continually limited by lack of repair parts. Furthermore, it was evident to evaluators that most XM-706's did not have the firepower of the gun-truck. The basic XM-706 has two M73 machineguns, and an M60 machinegun was added in most units. Other vehicles used by

the military police were the basic gun-jeep, already described, and the M113 armored personnel carrier (APC). These were more prevalent in Military Regions 3 and 4, where enemy encounters were infrequent.

(c) Aviation Elements

Aviation security and support was valuable to convoy operations. Transportation unit personnel stated that they had learned through experience that the enemy was reluctant to attempt convoy interdiction when air cover was present. However, due to large demands on aviation assets, air cover over a convoy was rare. Aviation units reported that gunships (helicopters equipped with a weapon system) usually were provided on an on-call basis. Reaction time varied, depending on the location and situation [see paragraph II-5c(1) for examples].

(d) Other Forces

Interviews and informal discussions with convoy personnel showed that other forces were occasionally used if the situation was critical. These included infantry troops, armored vehicles, and artillery forward observers.

(4) Command and Control Elements

Command and control elements belonged to two organizations: i.e., the transportation unit (convoy commander, advance party commander, and/or gun-truck NCOIC's) and the military police unit providing highway escort and convoy security.

(a) Equipment

1. Communication

All convoy commanders interviewed said that communication played a major role in coordination between the different sections of the convoy as well as with outside agencies. The basic radios used in convoys were the AN/VRC-46 and -47. Convoy commanders believed that the radios were of value, but stated that they were seriously limited by distance and terrain. The AN/GRC-106, single sideband radio was successfully used on some convoys for long-distance communications. Transportation unit personnel indicated considerable enthusiasm for use of such radios, limited only by the fact that they were in very short supply.

2. Vehicles

Vehicles of the command and control elements were generally the same types used for security purposes.

(b) Personnel

The command and control structure (i.e., convoy commander and serial commanders) was the same in all convoys. It was common practice to have an officer, usually a lieutenant, as convoy commander, with NCO's as commanders of the advance party, the trail party, and the security force. A variation observed was that officers also occasionally served as advance party commanders or as gun-truck commanders.

(5) Arrangement of Convoy Elements

Convoy arrangement, or configuration, was standardized. The following sequence was normally used: (1) advance (scout) party, (2) the main body, and (3) the trail party.

(a) Advance Party

The advance party, at the head of the convoy, was normally about 300 to 500 meters in front of the main body. This element usually consisted of at least a gun-jeep, a gun-truck, and a military police M-706, or any combination or quantity of these three types of vehicles. The primary mission of the advance party was to assure the safe passage of the convoy to its destination. The advance party proved its effectiveness on many occasions (for instance, on one convoy monitored by ACTIV evaluators the advance party found a culvert that was mined and booby-trapped).

(b) Main Body

The next element within the convoy was the main body, including all cargo vehicles. Dispersed throughout the main body were various numbers and types of security and control vehicles. For more efficient command and control large convoys occasionally divided the main body into several sections, called "serials." For the fifteen convoys which were documented in detail the evaluators recorded the number of serials and the number of vehicles per serial. The maximum number of serials in any one convoy was four, and the maximum number of vehicles per serial (including cargo, security, and command/control vehicles) was 28. The average number of serials per convoy was two, and the average number of vehicles per serial was 18. By contrast, a senior officer who had been provost marshal (and convoy commander on all convoys that passed through the division AO) for the 1st Infantry Division in 1966-67, said that during that time he had participated in convoys consisting of 300 trucks divided into 50-truck serials. The consensus of convoy commanders was that managability (i.e., the number of vehicles a serial commander could control effectively) determined the number of vehicles in the serial. The organization of the main body was usually similar, with vehicles carrying nonexplosive/noncombustible cargos placed in front, and those carrying explosive/combustible cargos, to the rear. The philosophy, as stated by convoy commanders, was that if a convoy were ambushed the

vehicles loaded with nonexplosive/noncombustible cargoes would be less likely to block the entire road if hit. Also, their experience had shown that the enemy, in initiating an ambush, generally tried to hit the vehicles with explosive cargo. With such vehicles in the rear, it was much more likely that the greater portion of the convoy could continue, even in the event of a major ambush. The size of the main body and the number of security assets dictated placenent of gun-trucks within the main body.

(c) Trail Party

The final element within the convoy was the trail party. This was the logistics element of the convoy. In almost all convoys monitored, the convoy commander led the trail party. Bobtails normally followed his vehicle, followed by a tire truck, recovery vehicles, and any other vehicles that accompanied the convoy. Also included in the trail party were a number of security vehicles.

d. FINDINGS - OBJECTIVE 3

(1) Two systems were in effect for establishing mission priorities: The MCC system and the TMA system [II-3b(1)(a)1; p. IT-?].

(2) Shipping requirements were submitted as an information packet, describing the cargo by size, weight, destination, suggested node of transport, and priority [II-3b(1)(a)2; p. 11-91.

(3) The priority systea used by the shipper was the MACV Integrated Priority System [II-3b(a)1; p. 11-91.

(4) There were no differences in planning scheduled or unscheduled convoys [II-3b(2); p. 11-10].

(5) Most transportation unit personnel interviewed considered intelligence of value in planning convoys [II-3b(3); p. II-10].

(6) Several agencies coordinated the movement of convoys [II-3b(4); p. II-11].

(7) Routes were color-classified in accordance with the level of enemy threat [II-3b(6)(a); p. 11-14].

(8) Logistics support for convoys was primarily a unit function [II-3b(6)(c); p. II-15].

(9) Both tactical and commercial vehicles were used in convoys [II-3b(6)(d); p. II-15].

(10) The antifragmentation cab kit used by the USMC prevented deaths from 40- to 60-pound mines [II-3b(6)(d)3; p. II-18].

(11) Drivers stated that they performed driver maintenance on their trucks; however, little or no driver maintenance was observable while on the road, and in RON situations very little maintenance was performed [II-3b(6)(b)4d; p. II-18].

(12) Two battalion commanders stated that higher headquarters had placed too much emphasis on having a high vehicle availability rate for a sustained period, at the expense of proper maintenance [II-3b(6)(d)4; p. 11-15].

(13) Vehicles were frequently dispatched on convoys when they were not safe or not operating efficiently [II-3b(6)(d)4; p. II-18].

(14) One unit commander attributed his unit's excellent maintenance to permanent assignment of drivers to each tractor trailer [II-3b(6)(d)4; p. II-20].

(15) There was dissatisfaction with both the quantity and the quality of towbars issued to units in RVN [II-3c(2)(b); p. II-20].

(16) Convoy security was either organic or provided by other sources [II-3c(3)(a); p. II-21].

(17) Organic security vehicles were tactical vehicles modified by the unit; the most common was the 5-ton gun-truck [II-3c(3)(b); II-21].

(18) Military police used XM-706 arcored cars, gun-jeeps, and M113 APC's to escort convoys [II-3c(3)(b); XI-231.

(19) Communications Flayed a major role in coordination between the different sections of the convoy as well as with outside agencies [II-3c(4)(a)1; p. II-24].

(20) The AN/VRC-46 and -47 radios were of value but were seriously limited by distance and terrain [II-3c(4)(a)1; p. 11-24].

(21) AN/GRC-106 single sideband radios were valuable for long-distance communication; however these radios were in short supply [II-3c(4)(a)1; p. II-24].

(22) Convoys were arranged into three groupings - the advance party, the main body, and the trail party [II-3c(5); p. II-25].

(23) The main body, including all cargo vehicles, was often subdivided into "serials;" each with its own commander [II-3c(5)(b); p. II-25].

(24) The average number of serials in convoys monitored was two; the average number of vehicles within each seriel was 18 [II-3c(5)(b); p., II-25].

4. (U) OBJECTIVE 4 - CONVOY COMMAND AND CONTROL PROCEDURES

a. Mission Instructions

(1) Convoy Commander

(a) Twenty-six convoy commanders responded to questionnaires concerning the source and content of the mission instructions they received. Almost all stated that they received an initial briefing from the transportation battalion S-3 the night before the scheduled departure. In these briefings the current tactical situation in the AO was presented; convoy details such as cargo, destination, and special problems were discussed; coordination instructions and any other pertinent plans were issued; any security to he provided from external sources was coordinated; and radio frequencies were provided. Most convoy commanders indicated that they did not receive enough communications information; radio frequencies of friendly units along the convoy route were frequently not provided. This was identified as a particular problem in that these tactical units often changed their tactical radio frequencies. However, the other coordinating information given the convoy commanders was found to be up-to-date and generally accurate.

(b) The convoy commander usually conducted a briefing for other convoy personnel prior to starting the convoy. This was a routine briefing, giving destination, current enemy situation, ambush SOP, breakdown procedures, speed limits, and reminding the personnel 30 wear protective vests and helmets. Most standing instructions pertaining to convoy operations were provided by unit SOP's. Most SOP's were found to be yc-to-date and providing complete and concise instructions for convoy personnel and the security force commanders. Only one of the 26 convoy commanders interviewed stated that his unit had no SOP.

(2) Security Force

(a) The security force commander was briefed by the convoy commander. Radio frequencies, current tactical situation, update of time schedules, and speed limits were discussed by the security force commander and convoy commander prior to the start, of the convoy.

(b) Transportation unit security forces received the same briefing as the convoy personnel prior to the start-point (SP) time. However, military police security force personnel received briefings from military police operations personnel of their parent unit. This briefing was conducted in the MP unit, area and normally covered the same information that the convoy commander received from his battalion. At that time the security force commander was also told (by his operations personnel) the type and number of security vehicles to be provided for his mission.

(c) The security force commander then issued mission instructions to his subordinates. These instructions generally covered destinations,

ambush SOP, vehicle breakdown SOP, and current enemy activity. Any changes in radio frequencies or SOP were discussed at this time. Security force personnel reported that the amount of detail covered was contingent upon whether the specific mission was routine or a variation from routine, and upon the need to brief new personnel.

(d) Both military police and transportation unit security, force personnel were interviewed regarding the mount of advance notice given them on specific operations. There was a significant difference between the two types of responses. Military police personnel all stated that they were notified of their mission in sufficient time to complete planning, normally 12-18 hours before departure. Transportation security force personnel, however, agreed that about one hour's notice was the maximum generally provided.

(e) All 17 military police security force personnel questioned reported that they had comprehensive and up-to-date SOP's; however, only three of six transportation security force personnel reported having any knowledge of a unit SOP. Evaluator observation and informal discussion confirmed that many transportation personnel were not aware of, or knowledgeable with their unit's SOP. The actions of the security force during ambushes and restrictions on the use of forces are discussed in paragraph II-5c (objective 5).

(3) Drivers

Mission instructions were passed down the chain of command to each individual member of the convoy. Unit policy, whether support commands or transportation units, required that the convoy commander brief his drivers prior to the start of each convoy. All transportation battalions had an outline briefing form (see Figure 11-12 for an example of the briefing outline). This form was uniform In general content throughout RVN. Although this briefing was also a USARV requirement, only 84 percent of the 85 drivers interviewed received a briefing. The 16 percent who indicated that they did not receive a briefing all operated in northern MR 1, where enemy incidents occurred at a higher rate than in my other area in RVN. Of those receiving briefings, 36 percent said the instructions did not cover all enemy-initiated situations that could arise during a convoy, 2nd 15 percent stated that they did not fully understand the instructions given them.

(4) Aviation

(a) Aviation convoy control, by either fixed- or rotary-wing aircraft, provided an airborne capability for detecting ambushes, calling gunships or artillery to extricate the convoy from en ambush, and providing communications assistance to the convoy. Forty-four percent of the aviation units surveyed provided convoy control support, with an average rate of 4.6 times ner week. This aviation control was sometimes hindered by lack of adequate coordination between requesting and supporting units.

1. SITUATION:

   a. Friendly forces
   b. Support units
   c. Enemy situation.

2. MISSION:

   a. Type of cargo
   b. Oripin
   c. Destination.

3. EXECUTION:

   a. General organization of convoy
   b. Time schedule
   c. Routes
   d. Convoy speed
   e. Catchup speed
   f. Interval
   g. Emergency measures:

      (1) Accidents
      (2) Breakdowns
      (3) Separation from convoy
      (4) Ambush
      (5) Medical support.

4. ADMINISTRATION AND LOGISTICS:

   a. Billeting
   b. Mess
   c. Refueling
   d. Servicing of vehicles.

5. COMMAND AND SIGNAL:

   a. Location of convoy commander
   b. Designation of assistant convoy commander
   c. Arm and hand signals
   d. Other prearranged signals
   e. Radio frequencies and call signs.

6. SAFETY:

   a. Hazards of route and weather conditions
   b. Defensive driving.

FIGURE II-12 (U). Convoy Briefing Outline.

(b) In coordinating a request for aviation support, 65 percent of the requesting units processed their requests through Field Forces or equivalent headquarters, and the remaining 35 percent were processed directly between the requesting unit and the supporting unit. Most of the requests represented by this 35 percent were based on recurring daily commitments. Thirty-three percent of the aviation units indicated that mission request information supplied was inadequate for mission performance, requiring additional coordination before the mission could be accomplished. This additional coordination was not always accomplished. Aviation units attributed the requirement for additional coordination to late receipt and incomplete information regarding the mission.

(c) Of the surveyed aviation units, 83 percent indicated receiving mission requests 12 hours or less before the mission was to be flown (This compared with 3 to 21 days advance planning for each convoy at the support-command level). The *lack* of timely notification and proper coordination caused the following problems:

1. Convoys were sometimes late by as much as one or more hours - while aircraft waited, airborne, at a checkpoint - sometimes resulting in the necessity to refuel the aircraft just as the convoy was entering the (aircraft's) area of responsibility;

2. Aircraft flying over convoys were not able to contact the convoy on the assigned primary or alternate radio frequencies;

3. Lack of panel markings on vehicles made it difficult for the aircraft crew to distinguish the convoy from other vehicles on the road;

4. Definite points for changing radio frequencies and support when changing AO's were not pre-established;

5. Convoys employing .50-caliber machineguns caused ricochets considered dangerous to supporting aircraft;

6. Many of the handoff points for change of responsibility were poorly planned, being located at critical terrain features which could have benefited enemy offensive action;

7. Common ground checkpoints were not uniformly named or numbered, leading to confusion in identification or location.

b. Command Relationships and Responsibilities

(1) In the actual conduct of the mission, all command elements were aware of the individual responsibilities assigned to them. Although coordination failures [see paragraph IIa(4)(a)] were evident at times, most commanders felt that they were able to communicate with their

counterparts in solving problems that arose.

(2) Convoy commanders were interviewed to determine their responsibility for commanding the convoy. Divisional SOP's and representatives stated that if tactical assistance were required by a convoy passing through the divisional AO, the senior ground tactical commander assumed command of the overall operation, and the convoy commander and his convoy came under the direct operational control of the tactical commander. However, most transportation convoy commanders stated that they retained command control of their convoy at all times, and that the tactical commander did not exercise control over the convoy. Evaluators did not find any examples of this tactical application of changing command during the period of the field evaluation.

(3) Tactical unit, military police unit, and transportation unit SOP's clearly defined the circumstances under which command was to be exercised by personnel other than convoy commanders. As stated above, the commander of the tactical unit reaction force was to take command in cases of enemy interdiction. Convoy command could also change when a column was moving through a tactical AO. In August 1968, after numerous ambushes on QL-22 between Long Binh and Tay Ninh, the 25th Division Provost Marshal was given the responsibility of overall command of convoys. The Provost Marshal flew in an aircraft and controlled the convoy jointly with the original convoy commander on the ground. In case of ambush the command of the convoy again changed, from the division provost marshal to the CO of the cavalry unit responsible for reaction to the enemy. Several conferences had been held prior to establishing this procedure; in these meetings representatives from transportation commands, military police commands, and divisions defined relationships and responsibilities. The information had been published in jointly coordinated SOP's and distributed to all involved parties. Evaluators saw evidence of this type of planning in other parts of RVN working with equal success.

c. Chain of Command

(1) Evaluators' interviews and personal observation of convoys revealed that the chain of command within most convoys was clearly defined. The convoy commander commanded the entire convoy, whether he was the transportation commander or a division provost marshal. The commander designated any number of personnel he considered necessary as subordinate commanders for control of the elements of the convoy. This often included an advance party commander, an organic security force commander, and/or any other personnel he considered to be essential for effective control. Each of these subordinate commanders established a chain of command—i.e., serial commander (who commanded a given number of vehicles in the convoy), to platoon sergeant, to driver.

(2) The duty of the convoy commander was to control the entire convoy from the staging area to the destination, and return. The advance

party commander and his element set the pace of the convoy. The lead vehicle was 300-500 meters in front of the lead vehicle of the main body. The advance party provided early detection and warning of enemy emplaced obstacles, enemy personnel, mines, boobytraps or other barriers that could stop the convoy.

(3) The serial commander's mission was to ensure convoy discipline, including drives alertness, and the conduct; of drivers, "shotgunners" (an armed guard of a vehicle), and all other personnel within his serial. He also monitored the serial speed and vehicle interval.

(4) The trail party commander's mission was to see that all vehicle breakdowns were repaired expeditiously; if a vehicle were not immediately repairable on site, the commander insured that the vehicle and its cargo were recovered. The trail party commander used bobtails, recovery vehicles, maintenance equipment, and any other equipment necessary, in accomplishing his assigned tasks. He also ensured that shifted loads were unloaded and secured whenever necessary.

(5) The security force commander, whether the force was military police or an organic element of the transportation unit, was in command of all security elements. He insured quick reaction to enemy interdiction. In event of an ambush, the forward security force vehicles led as many convoy vehicles out of the "kill zone" (area under enemy attack) as possible. Those vehicles which had not entered the kill zone were stopped and their drivers assumed a defensive role; other security vehicles placed maximum available suppressive fire on enemy positions. If necessary, these security vehicles were *to* enter the kill zone *to* extract trapped drivers and vehicles.

d. Chances in Convoy Command Structure

Some SOP's specified an officer of a certain rank to act in the capacity of convoy commander. An example of this, reported to evaluators, was at Cam Ranh Bay, where a previous SOP had required that critical convoys were to be commanded by captains. An evaluator was told that the reason for this was the belief that captains were more knowledgeable than lieutenants; therefore, they should be better qualified to command convoy operations. That policy was changed and the most highly qualified man in terms of convoy training and experience was appointed as convoy commander, even when accompanied by an officer senior to him.

e. Capability of Command and Control Personnel

(1) Qualifications of Personnel

(a) The majority of convoy commanders were lieutenants serving their first tour of duty in RVN. All convoy commanders interviewed said that the training they received in the basic course of their branch had not prepared them for their role in convoys. To compensate

for this lack of training, a program of on-the-job training (OJT) was necessary. In many cases, officers of various branches were assigned to truck companies as platoon leaders and convoy commanders. Although all branch schools dealt with convoy movements and ambushes, it was noted by evaluators that branch school instruction often differed from unit SOP's in tactics to be employed in ambush situations (An example of this was noted during a troop-movement convoy along QL-19 . Transportation unit vehicles were moving an infantry unit when the convoy was ambushed. In accordance with unit SOP, the drivers immediately increased speed to drive out of the kill zone. One of the drivers stated that he looked back and all of his passengers were jumping from the vehicle to engage the enemy).

(b) It was also found that drivers and other convoy personnel were not always qualified in their military occupational speciality (MOS). Men of varying backgrounds and training were assigned to the truck units. Transportation battalions found it necessary to conduct a drivers' school and an extensive OJT program to train these men. Through these schools and the training programs, commanders interviewed felt that the majority of those individuals awarded MOS 64B (Heavy Truck Driver) became well qualified.

(2) Availability of Personnel

All transportation unit commanders stated that the average of 80 percent availability of personnel was a major problem. [An average of 25 men per day per medium truck company were required for perimeter guard, company details, and extra duty. Normal leave, R&R, physical profiles, and administrative functions accounted for a daily average of 10 additional men being unavailable for duty. This loss constituted about 20 percent of the 183-man authorized strength of the company (MTOE 55-18G)] In the conduct of each convoy, personnel in addition to the drivers were needed to serve as security force crews and "riding shotgun" on individual vehicles. Although these personnel were required in the convoy, they were not performing driving duties. The number of convoy personnel involved in these non-driving duties varied with the size of each convoy.

f. FINDINGS - OBJECTIVE 4

(1) Changes of radio frequencies by tactical units along the convoy's route presented a problem because they were not adequately covered in the commanders briefing [II-4a(1)(a); p. II-28].

(2) The convoy commander usually conducted a briefing for convoy personnel prior to the start of the convoy, giving destination, current enemy situation, ambush SOP, breakdown procedures, speed limits, and reminding personnel to wear protective helmets and vests [II-4a(1)(b); p. II-28].

(3) Most unit SOP's were up-to-date and provided complete and concise instructions [II-4a(1)(b); p. II-28].

(4) Military police convoy security forces were given 12-18 hours planning time before convoy departure, but organic transportation security forces generally received only one hour's notice [II-4a(2)(d); p. II-29].

(5) In many cases, mission instructions given aviation units by transportation units were found to be inadequate and too late to allow proper planning of air support [II-4a(4)(b); p. II-31].

(6) Lack of panel markings on vehicles made it difficult for aircraft overhead to distinguish the convoy vehicles from other vehicles on the road [II-4a(4)(c)3; p. II-31].

(7) Most convoy commanders stated that they retained command and control of the convoy at all times, and denied ever relinquishing this control, despite the fact that divisional SOP's required that the tactical commander assume control whenever the convoy required tactical assistance. [II-4b(2); p. II-32].

(8) The chain of command within the typical convoy was clearly defined, and the convoy commander, whether the transportation commander or a division provost marshal, commanded the entire convoy [II-4c(1); p. II-32].

(9) The commander designated any number of personnel as subordinate commanders deemed necessary for control of the elements of the convoy; this often included commanders of the advance party and the organic security force and/or any other personnel he felt were essential for effective control [II-4c(1); p. II-32].

(10) The duty of the convoy commander was to control the entire convoy from the staging area to the destination, and return [II-4c(2); p. II-32].

(11) All convoy commanders indicated that their basic course had not prepared them for their role in convoy operations [II-4e(1)(a); p. II-33].

(12) Transportation battalions had found it necessary to conduct OJT for enlisted personnel assigned to transportation truck companies [II-4e(1)(b); p. II-34].

(13) All transportation unit commanders indicated that the 80 percent availability of personnel represented a serious problem [II-4e(2); p. II-34].

5. (C) OBJECTIVE 5 - TACTICS AND TECHNIQUES IN CONVOY SECURITY

a. Preparation of LOC's

(1) Land Clearing and Road Paving

(a) Land clearing, illustrated in Figures II-13 and II-14, consists of removing foliage, trees, vegetation and any objects that offer cover and concealment to the enemy for some distance on both sides of an LOC. Land clearing was accomplished by engineer heavy equipment, primarily crawler tractors with Rome plow blades (Figure II-15). According to units surveyed and records of US Army Engineer Command, Vietnam, the width of the area cleared was usually 100 meters on each side of the road. However, this varied with terrain, availability of personnel and equipment, and local restrictions (e.g., crops, tree plantations, and buildings). Clearing the land along LOC's denied concealment and cover close to the road, thereby forcing the enemy to position ambush elements at a greater distance from the intended target. Although there were no quantitive data available, engineer and convoy personnel felt that land clearing decreased the effectiveness of the enemy's ambushes and increased their vulnerability to countermeasures. The vast majority of the units surveyed indicated that daily road clearing and mine-sweep operations were considerably easier along LOC's which had benefitted from land clearing operations. According to engineer units, however, land clearing did not eliminate the road-mine problem entirely, since most enemy mining activity took place during the night while the roads were not under surveillance.

(b) Paving of LOC's in RVN was performed primarily to improve the road net throughout the country. However, paving did provide side advantages to the countermining activities of US forces, as discussed later in this report (paragraph II-6).

(2) Road Clearing, Obstacle Detection, and Clearing Methods

(a) Logistical convoys depended almost entirely on other units to insure that the LOC's were cleared. Clearing a road varied from one MP gun-jeep crew's driving a designated route and visually checking the road, to an extensive road sweep involving engineer mine-sweep teams, mine dogs (dogs trained to detect mines), aircraft cover, and infantry flank security. The amount of effort expended to clear a road depended on the local situation and the local commander's requirements for opening the road.

(b) The evaluators observed only the detection or clearing of mines and one boobytrap (an M26 grenade in a can with a trip wire), which was left for an ARVN unit to disarm. Hence, most of the information on obstacle detection and clearing methods was based on interviews with transportation and MP unit commanders and personnel. Clearing the road of mines involved various techniques described in detail in paragraph II-6.

UNCLAS

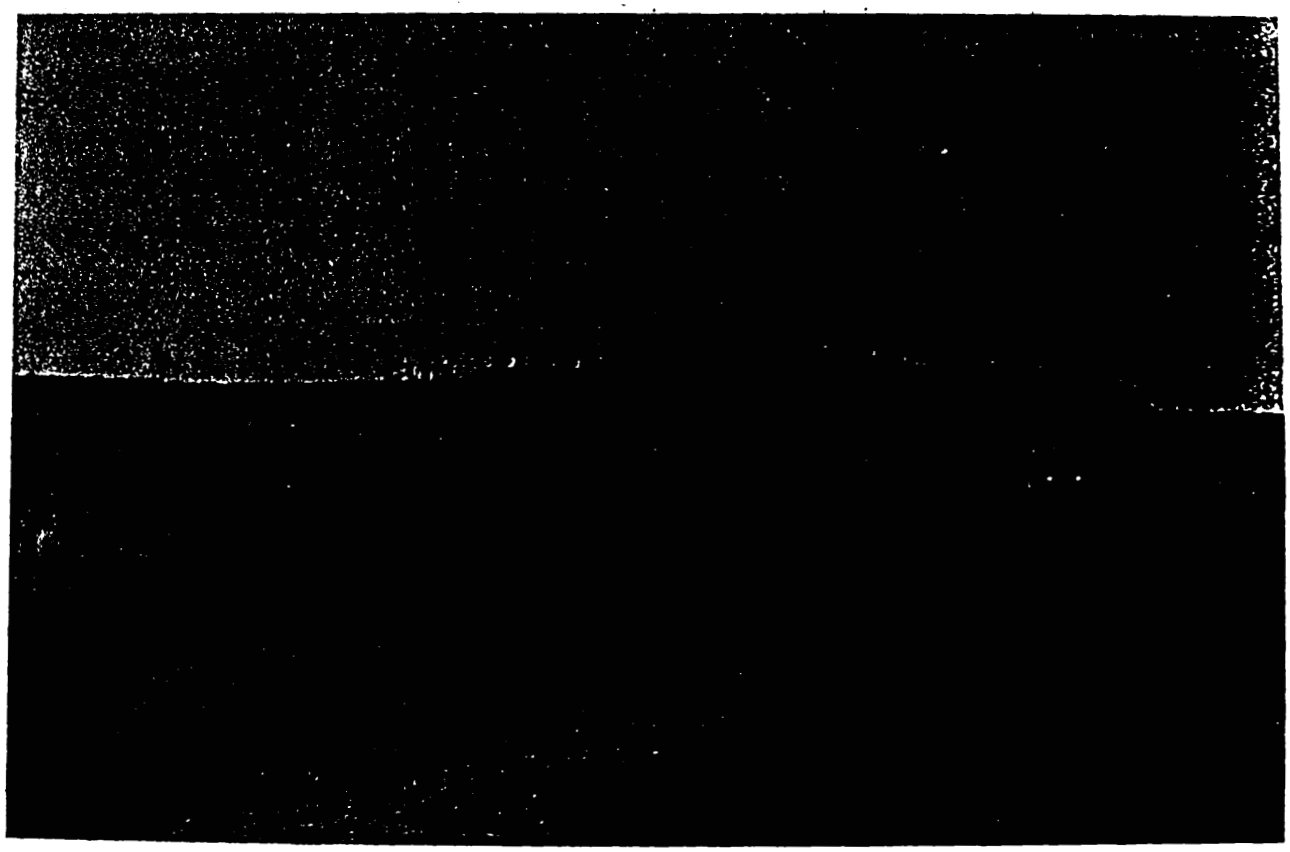


FIGURE: **11-13** (U). Land Clearing.

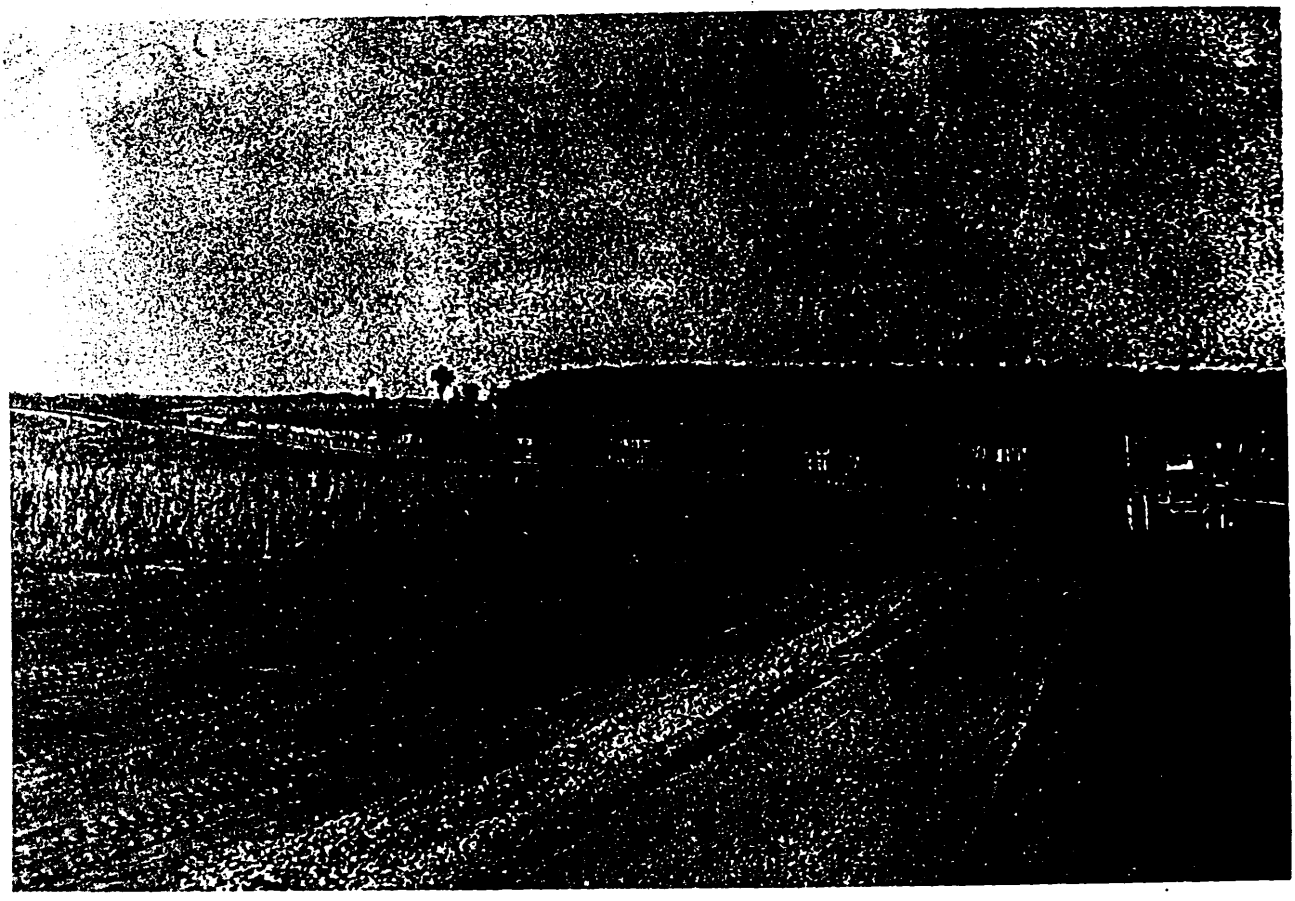


FIGURE II-14 (U). Land Clearing.

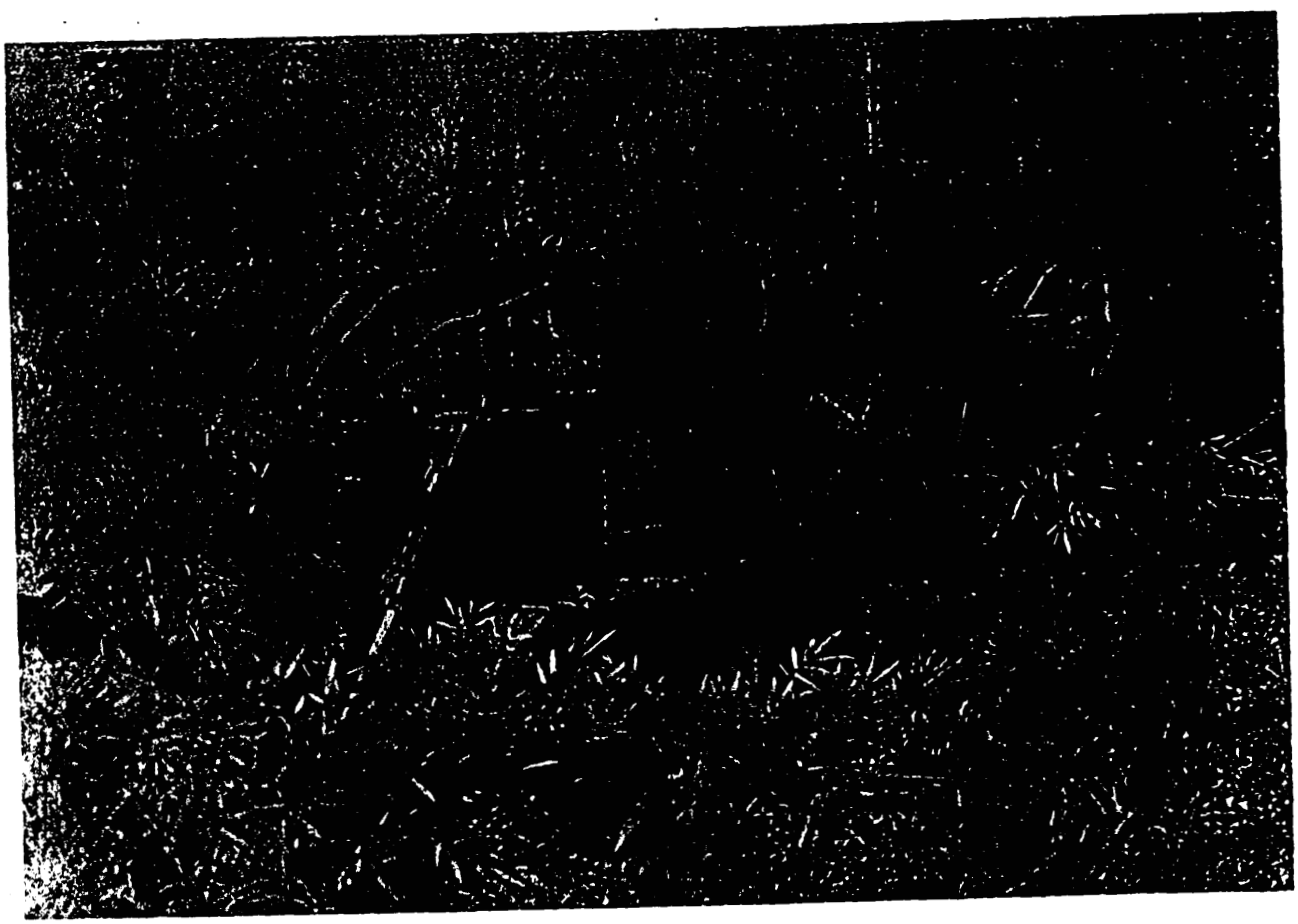


FIGURE II-15 (U). Pome Plow.

(c) According to personnel interviewed, any obstacle that could be encountered (e.g., roadblocks, craters, overturned vehicles) could be boobytrapped. When asked what action they took on encountering obstacles, the convoy and security force commanders replied they halted the convoy and established local security, while the convoy security force or convoy commander checked out the obstacle. Most personnel interviewed agreed that this situation had rarely been encountered.

b. Enemy Ambush Tactics

The Combined Intelligence Center, Vietnam (CICV) intelligence reports and Order of Battle Study ST-67-026 (paragraph I-1, reference f) were used extensively as a source of information on Viet Cong (VC) ambush tactics. References d, e, and r provided additional data on enemy ambush tactics. The VC were known to rely heavily on ambush as a means of initiating contact. A review of ambush incidents, gathered from CICV intelligence reports and evaluator interviews with personnel who were actually involved in convoy ambushes, indicated a consistent pattern of techniques (see Annex I for illustrations and discussion of VC ambush formations). The CICV reports noted that in many cases the VC would bide their time and wait for a particular target which they considered within their capability to destroy, or one on which they could inflict maximum damage and casualties. An example of this characteristic is found in Annex B, which outlines an actual (and somewhat typical) VC/NVA convoy ambush. CICV and USARV studies show that the VC/NVA prefer the deliberate ambush, since they have a special organization to accomplish this specific mission. Fron these studies (paragraph I-1, reference f), it was found that the enemy considered detailed intelligence and planning essential to accomplish a deliberate ambush successfully, and his plans sometimes took several weeks to complete. The enemy did sot attempt an ambush without accurate and timely intelligence because the risks involved were too great. Consequently, he conducted the ambush only when all factors were apparently in his favor. Necessary intelligence information for the enemy included route and time of movement of the convoy, type of indirect fire support available to the convoy, weapons, disposition and response time of reaction forces, and state of training of the Free World Military Assistance Forces (FWMAF). The VC/NVA carefully selected ambush sites which were advantageous to him and, at the same tire, placed the target unit in the most unfavorable position possible. The VC/NVA commander normally made the reconnaissance and personally selected the ambush site. Usually the VC/NVA unit moved to within one day's march of the ambush site a few days prior to the planned date of ambush. A location concealed from aircraft was selected. Fortifications were prepared around the ambush site. Trenches were usually dug and positions for crew-served weapons were prepared. Movement to the ambush site was over a concealed route, and every effort was made to avoid villages and roads in order to preserve secrecy. When the terrain at the ambush site did not offer the degree of secrecy and concealment desired, the VC/NVA occasionally did not occupy their prepared positions until shortly before the approach of the target convoy.

c. Tactical Reaction to Ambushes

(1) ~~General~~

(a) The enemy ambush action, consisting of the initial shock action, the quick-kill, the mop-up for specific missions, end the withdrawal, normally lasted only 20 tc 30 minutes. Because of this limited time span of actual contact, tactical reaction, to be successful, had to be quick and powerful, in an effort to make convoy ambushes so costly to the enemy that he would be hesitant to conduct them. The mere presence of a tactical unit In an area did not necessarily mean the area was secure. The (USA) 4th Infantry Division and elements of an ROK divisicn were located along highway QL-19. Nevertheless, both ambushes and mining incidents along QL-19 were very common, and the frequency was among the highest in the country.

(b) Counterambush procedures were followed in accordance with the counterambush techniques outlined in references n, p, r, and s (see paragraph I-1).

(c) Convoy commanders were normally not involved with the employment of tactical reaction forces. The convoy was to clear the ambush site as quickly as possible, and when a tactical reaction force reached the scene of an ambush, the reaction force commander took charge of engaging the enemy force. The convoy commander furnished the location of the ambush force and any other information available, but did not take part in countering the ambush. Convoy commanders said that they occasionally had to direct gunship strikes, usually in the absence of a spotter aircraft, but their primary concern was still to extricate their convoy from the area.

(2) Employment of Air Support

Of the 55 aviation units sampled, 59 percent had directly supported convoy operations, while 41 percent had provided little more than "on-call" reaction forces to support any emergency requirement. The latter units had supported few convoys due to the low level of enemy activity against convoys over the preceding year. Although enemy activity had increased during operation LAMSON 719, aviation support was not available to support convoys during that operation. The survey showed that aviation elements had provided added security in areas which posed significant potential ambush hazard due to terrain features. In general, terrain hazards which could enhance the enemy's chances for a successful attack included mountain passes, areas of extensive jungle, and areas where heavy vegetation had cot been cleared along the roadway. Aviation support was provided as follows: convoy reconnaissance (see paragraph II-3b(5)(a)2.a. for discussion); convoy control (see paragraph II-4a(4) for discussion); and convoy security, (see

paragraph II-3b(5)(a)2 for discussion). Convoy security was provided by aircraft flying direct support of corvoys or standing-by on strip alert.

(a) Aircraft in Direct Support of Convoys

Based either on hours flown or on missions performed, the O-1 airplane (Figure 11-6) had provided cost of the direct air support for convoys. Respondents estimated that 20 percent of the available O-1 aircraft supported convoy operations. Survey respondents stated that a serious disadvantage to using helicopters rather than the O-1 was that direct air support for convoys represented a requirement for a great amount of flight time, which was not generally available from helicopter units. This shortage of flight time was partly the result of a directive by COMUSMACV, issued in September 1970, to reduce programmed flying hours by 15 percent. This reduction of flying hours had led to the use of a second method for providing aircraft for convoy security, the "strip alert."

(b) Aircraft Standing-by on Strip Alert

The strip alert was normally used by helicopter WE-ship teams which were prepositioned in the general area of expected need. In some cases, the aircraft crews remained in the helicopters, monitoring the progress of the convoy with an AN/PRC-25 radio as the convoy passed the most critical points. Survey interviews indicated that this procedure had reduced from 4 or 5 minutes to less than 2 minutes, the average reaction time required to get the aircraft airborne. The travel time from standby positioning to the scene of the ambush was less than 10 minutes in almost all cases and frequently less than 5 minutes. The result was that gunships often arrived on site within 5-10 minutes after the ambush was initiated. This allowed the gunship teams to engage the enemy before these forces broke contact with the convoy and dispersed.

(c) Routine Aircraft Standby Reaction Teams

1. The "routine reaction team" was the third means of providing airborne convoy security. With the exception of the helicopter gunships placed on strip alert, the surveyed aviation reaction forces stated that they were seldom placed on standby specifically to support convoys in event of ambush. Seventy-nine percent of the surveyed units were prepared to get a team airborne in 5 minutes or less. The average flight time for the reaction team to reach the ambush site could not be determined. Withdrawal of US forces, including aviation units, has expanded the remaining aviation units' areas of responsibility. The problem of extended areas of responsibility was further complicated by the reduction in the number of refueling units in those areas. As an example, a reaction team from Long Binh would have had

to travel 45 minutes to the forward refueling point at Tay Ninh, refuel, and only then could have responded to the request for assistance. Even this estimation did not take into consideration any time required to pass ambush information from the site, through channels, to the responding aircraft crew.

2. Requests for gunship support were met in many instances by airborne fire teams In the immediate area. A unique system employed in the Da Nang area by the US Marines, US Air Force, end US Army expedited gunship reaction forces. The services alternated in providing forward air control (FAC) coverage in the area of Hai Van Pass. When an ambush occurred, the FAC called the fire-team reaction forces directly, and the fire team was launched. XXIV US Corps monitored the radio net and could cancel the mission if desired. Otherwise, the mission proceeded as requested. In the meantime, the FAC obtained any required fire clearance, thus enabling the fire team to react and to engage the enemy in the lezst amount of time. The units which provided these fire teams were enthusiastic in their praise of this system of dispatch.

(d) Advantages of Aviation Employment

1. Every transportation unit surveyed stated that aviation elements were a deterent to enemy action against convoys.

2. Reports from EVA PW's and Hoi Chanhs indicated that they feared helicopters, and particularly gunships.

3. Reconnaissance airplane companies considered the O-1 aircraft the best cosvoy cover aircraft because of its long fuel endurance time, ease of flying, and ability of the pilot to observe the convoy and direct artillery fire or air strikes.

(3) Employment of Security Forces

(a) Transportation unit commanders generally agreed that they needed heavily armed security forces for convoy security. However, the personnel and equipment of the transportation unit frequently had to be drawn from the unit's primary mission to provide this security (see paragraph II-3c(3) for composition of the security force). The mission of these armed elements was to deter an ambush by their presence and, in the event of an ambush, to provide covering fire while the convoy moved rapidly away from the ambush site. Personnel of these elements stated that they also entered the "kill zone" of the ambush whenever necessary to extricate personnel and equipment. They were not expected to engage the enemy in a fire-fight or to destroy

the ambush force. The clearing of the ambush site and destruction of the ambush force was left to the tactical reaction forces. If the tactical reaction forces were physically with the convoy (a situstion which occurred less and less frequently as US troop strength declined), they immediately engaged the *enemy* ambush forces, but the convoy itself, and its security force, left the area as rapidly as possible.

(b) MP units fulfilled their security mission by providing a convoy *escort* force to counter ambushes. The following is extracted from a sample patrol order for military police highway patrols as used in March 1971 by an MP battalion (this concept was used by all nondivisional MP units throughout RVN):

> "Highway patrol units will not engage in fire-fights unless it is clearly necessary. They will not respond to enemy action as a reacticn force.
>
> "When subjected to sniper fire, the patrol will use the available cover of the patrol vehicle and continue to move. The patrol will immediately report the enemy contact to (as designated by the unit CO).
>
> "When subjected to individual ambush, *the* patrol will react in the same manner as for sniper fire. When subjected to, *or* aware of, a convoy ambush, the mission of the patrol is to insure that the convoy keeps moving, clears the kill zone, and proceeds on to its destination. Patrols will not stay back to engage the enemy. To accomplish their mission, they will establish traffic control points to prevent other vehicles from entering the bill zone, and when feasible without unduly endangering the patrol unit, extract wounded or stranded personnel from. the zone.
>
> "Patrols will not call for supporting fires.
>
> "Under no circumstances will fire be returned without the clearance of the patrol commander. Fire will be returned only when the enemy target is clearly identifiable and such fire will in no way endanger innocent persons or villages."

(c) To augment forces provided by the MP's, and to provide security when operating in areas where MP units were unable to provide escort for every convoy, transportation units developed the gun-trucks previously described (see paragraph II-3c). Whether MP's provided escort or the convoy relied on its own "organic" forces, or, as was generally the case, there was a combination of both, the tactical employment of both security forces was the same.

(4) Planned Artillery Support

Evaluators, unit commanders, and convoy personnel informally discussed the tactic of planning artillery fire support along the entire convoy route. It was generally agreed that this was desirable, but rarely done; lack of assets was the major problem. Also, coordination with ARVN and FWMAF artillery units was difficult. There was only one instance in which evaluators observed preplanned artillery fires. It involved a high-priority, combat-essential mission during Operation LAMSON 719.

d. Halted Convoys

(1) Unscheduled Halts

The evaluators found vehicle breakdowns and disrupted LOC's to be the primary cause for unscheduled halts. Enemy damage to roads and bridges was an ever-present threat to convoys, but actual occurrences observed or reported were rare. However, LOC's were frequently disrupted by causes other than enemy action.

(a) Vehicle Breakdowns

1. Drivers of disabled vehicles pulled off the road and waited until the trail party arrived. This was SOP for all units surveyed. During periods of high levels of enemy activity, units sometimes required that the vehicle following the disabled vehicle also pull off the road. When the trail party arrived, that entire element halted, repaired the vehicle and returned it to the convoy, or recovered it and incorporated it into the trail party. All of the units surveyed used a trained maintenance officer or maintenance sergeant to command the trail party. Units surveyed indicated that abandonment was used only as a last resort. Only during Operation LAMSON 719 were abandoned vehicles ever observed (along QL-19).

2. Interviewed unit commanders indicated that security had to be provided the trail party, especially during recovery operations. It was found that 21 units, all of which were located in MR's 1 and 2, had hardened vehicles armed with automatic weapons as part of the trail party.

(b) Disrupted LOC's

1. There was considerable construction continuing on new roads and bridges, as well as frequent repairs being conducted on existing ones. This caused many unscheduled halts (see Figures 11-16, -17, and 18). Traffic control at "choke points" such as single-lane bridges or roads, also halted or delayed convoys.

2. Flash floods and landslides also caused convoys to make unscheduled halts. The majority of these incidents occurred in isolated or sparsely settled areas.

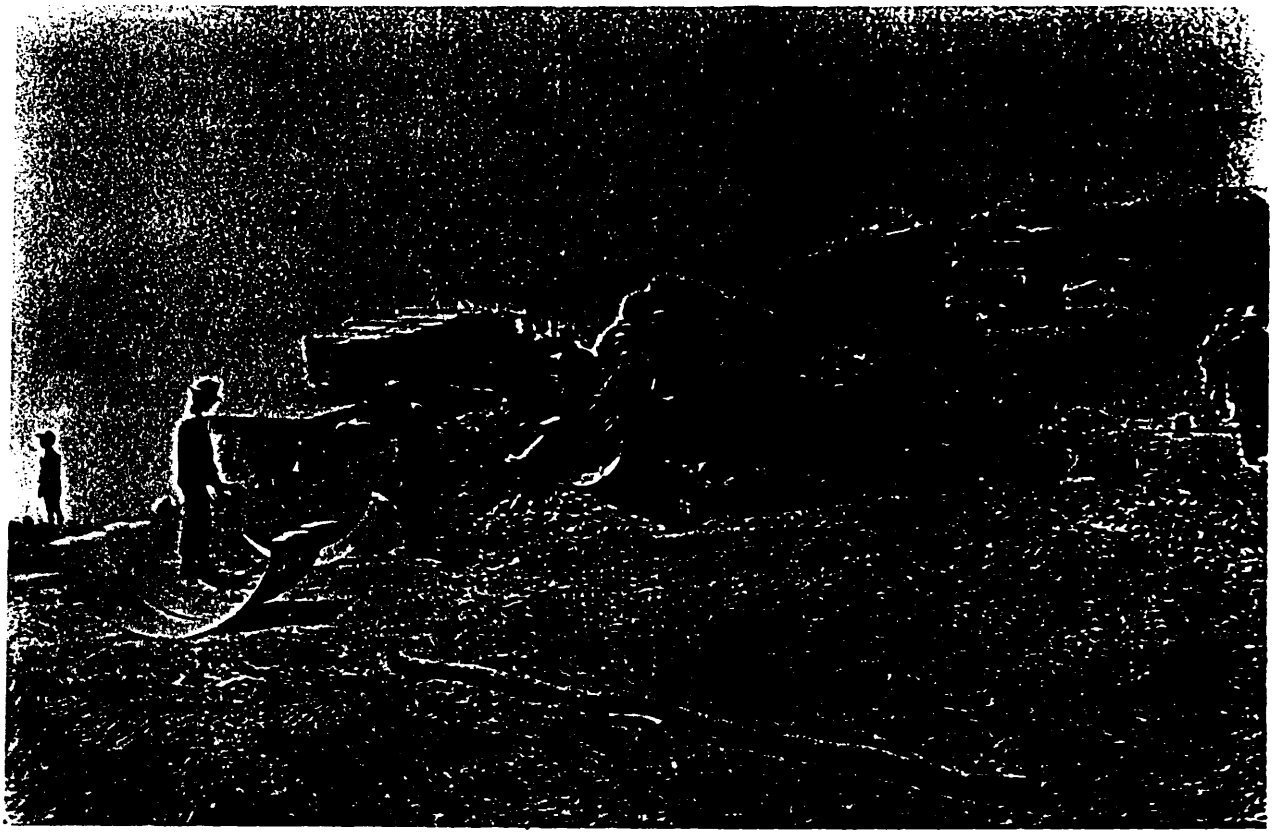


FIGURE 11-16 (U). Road Repair.

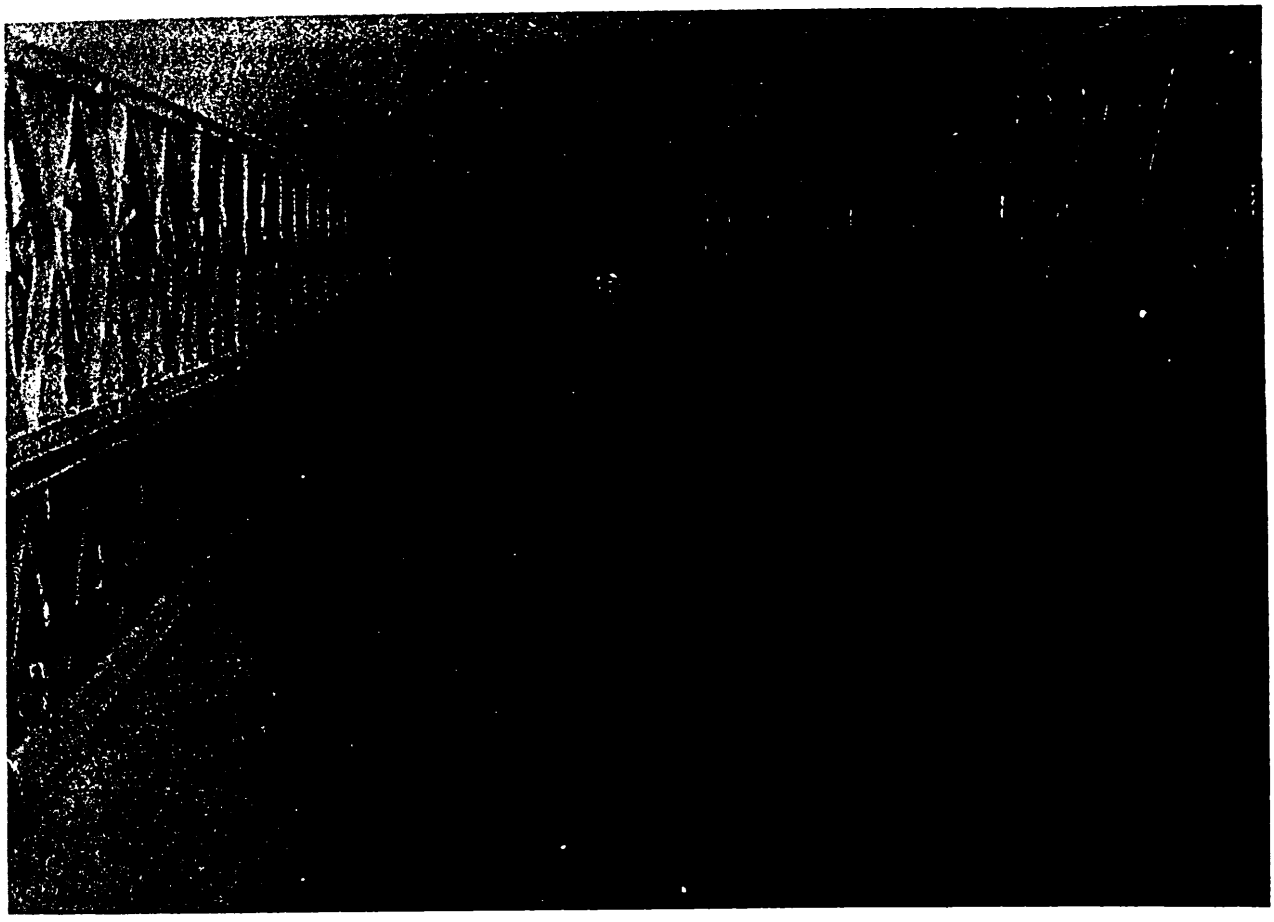


FIGURE 11-17 (U). Bridge Repair.

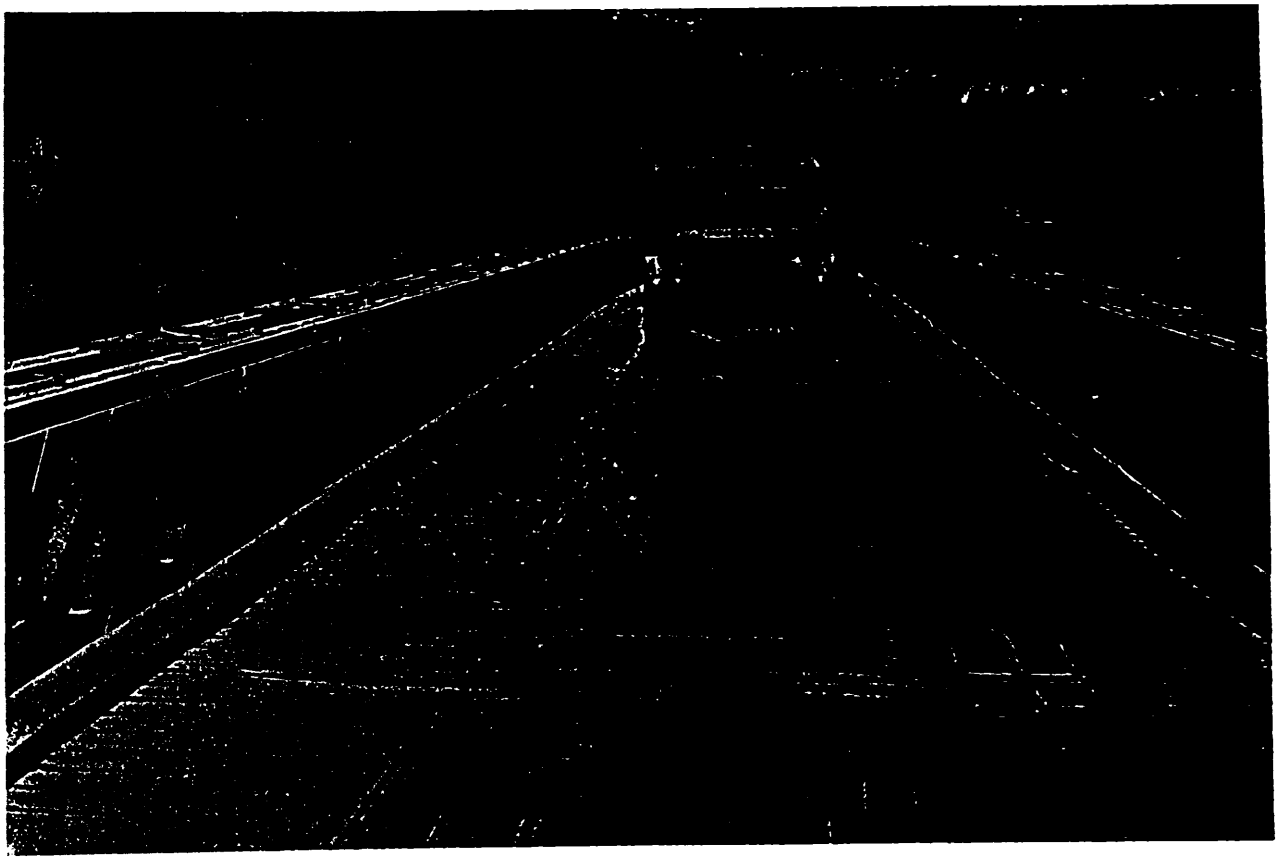


FIGURE **11-18 (U). Bridge** Repair.

(c) Security and Safety Precautions at Unscheduled Halts

1. Examination of unit SOP's and interviews with convoy personnel revealed that there were established procedures concerning the handling of unscheduled halts.

2. Convoy commanders all agreed that a convoy should be halted only at points where there was an undbstructed view of at least 200 meters to the front and rear of the column, with no restricticns to observation (i.e., curves or grades), and that drivers should try to pull their vehicles as far to the side as possible.

3. Convoy commanders also indicated that drivers were directed to maintain the prescribed vehicle interval distance while halting and to keep local civilians away from the convoy vehicles. They also stated that drivers should try to halt their vehicles off the rod, in order to keep the traveled portion of the roadway clear for continuing traffic, and should post guards at the front and rear of the convoy to warn approaching traffic of the presence of the halted convoy. However, despite this apparent command emphasis, improper vehicle interval in the halted convoys was generally the case, as observed by evaluators. When a convoy halted, almost invariably the vehicles were bunched up, even in known hostile areas (see Figure II-19). Furthermore, no attempt was made to keep local civilians away from the convoy and off the vehicles, on most of those convoys accompanied by evaluators.

4. During halts for a disrupted LOC, convoys were particularly vulnerable to hasty ambush or sniper fire. Drivers were expected to be responsible for security of their own trucks and for surveillance of the immediate area around their trucks during unscheduled stops; however, evaluators noted that the drivers generally demonstrated little concern for anything outside the cabs of their own trucks.

(2) Scheduled Halts

During line-haul operations, it was usually necessary to make one or more scheduled halts for refueling, inspection and maintenance of equipment and for mess, rest, and relief. Locations for scheduled halts were selected before the departure of the convoy by SOP and in actual practice observed. These sites were usually in a relatively secure area and, whenever possible under the surveillance of a security force. These scheduled halts were generally at RON sites and were planned to occur at USA compounds or fire support bases (FSB's) along the route or at the convoy's destination.

e. Special Procedures to Prevent Losses from Other Than Enemy Action

(1) Pilferage, Damage, and Loss En Route

(a) Discussions with drivers, MP's, and convoy commanders, and observations by evaluators indicated that local nationals who gathered around vehicles in the assembly area, or during scheduled or unscheduled

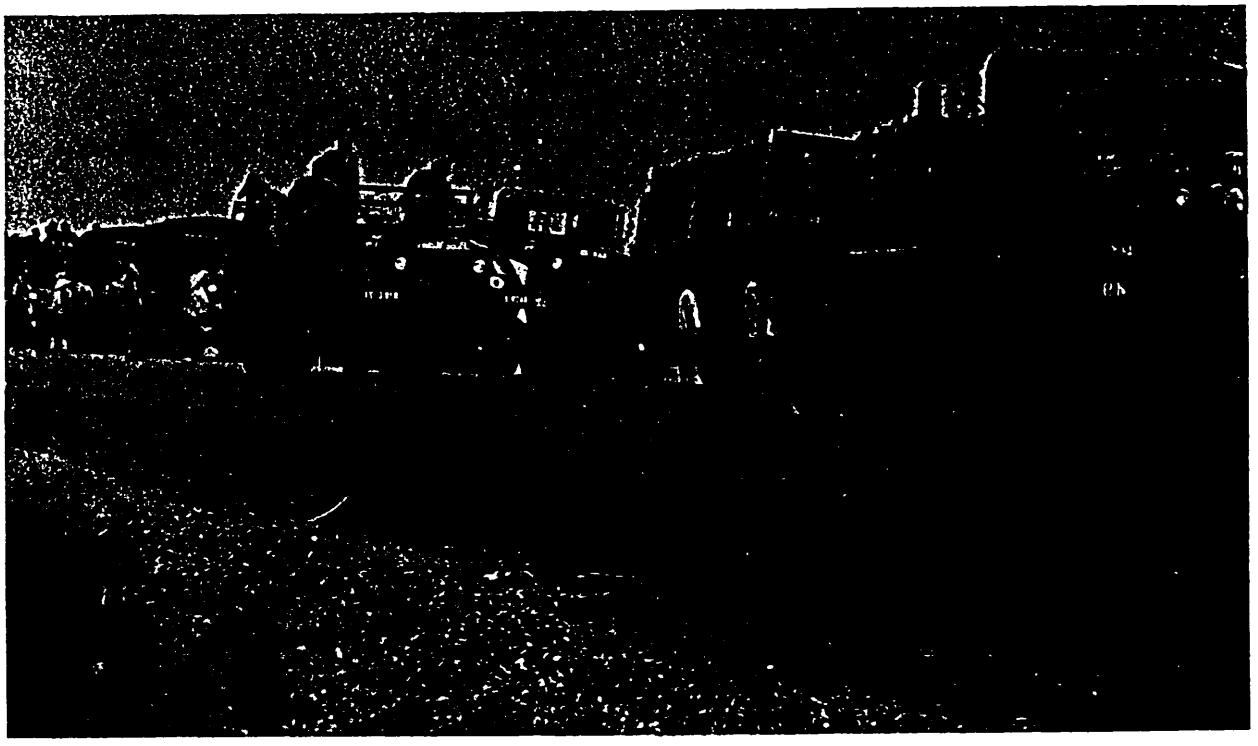


FIGURE **11-19 (U).** Convoy Halted on **Road.**

halts. were a potential source of sabotage and the acknowledged source of much pilferage. On most convoys which evaluators accompanied, the drivers were observed to be generally lax in their dealings with local nationals, to the extent that girls and children were often observed in the cabs of the trucks. This obviously was a dangerous practice, distrating the driver's attention away from his vehicle and surveillance of the surrounding area. Thefts of driver's personal equipment were fairly common and were observed by the evaluators on several scczsions.

(b) There were no hard data available to indicate the amount of supplies or equipment lost by convoys to pilferage, damage, or other local nationals, usually in built-up, congested areas while the convoy was moving very slowly, or during halts. One method reported was LN's boarding the back of a refrigerated van and throwing the supplies out to accomplices while the convoy was spread out and moving slowly through a congested area. This technique was considered a common practice. The vehicle driver did not detect the loss until later, although it was sometimes observed by the driver of the vehicle following. Several drivers stated that locks offered little or no protection, and, as the broken lock was the driver's personal loss, they had stopped putting locks on the vans. A similar method of pilferage was observed in operation against S&P trailers. Another method used to pilfer supplies occurred at halts. It was observed that while the drivers were away from the trucks at a roadside stand, the load was pilfered by local civilians.

(2) Loading for Minimizing Damage and Losses

Damage and inadvertent loss of cargo (not to be confused with pilferage) were caused by a combination of poor loading techniques (Figure II-20), insecure loading and improper tie-down prior to departure (Figures II-21 and 22), rough roads (Figure 11-23), and careless driving habits. The more flagrant of these deficiencies were brought to the attention of the convoy commander by the accompanying evaluators,

(a) Based on numerous observations by evaluators, the major cause of damage and loss en route was lack of proper tie-down procedures (Figures 11-21 and 32). The normal procedure (as observed by the evaluators) was to prepare the loads at the depot and either move then to a trailer transfer point (TTP) to be picked up by the hauling unit or have the unit pick the loads up directly from the depot, The loads were inspected by the drivers and usually by the convoy commanders. Frequently the loads were not properly secured when picked up by the drivers, necessitating the use of the unit's own chains and binders. Units in Da Nang had managed to get nylon aircraft cargo straps, which proved quite effective, However, it was observed that there usually were not enough tie-downs available to secure the loads properly. It appeared to evaluators that the problem usually originated at the depot. Either the loads were haphazardly secured or the banding material used was too light to take the strain of heavy cargo and rough roads; in either case, the load began to break loose at some point during the trip,

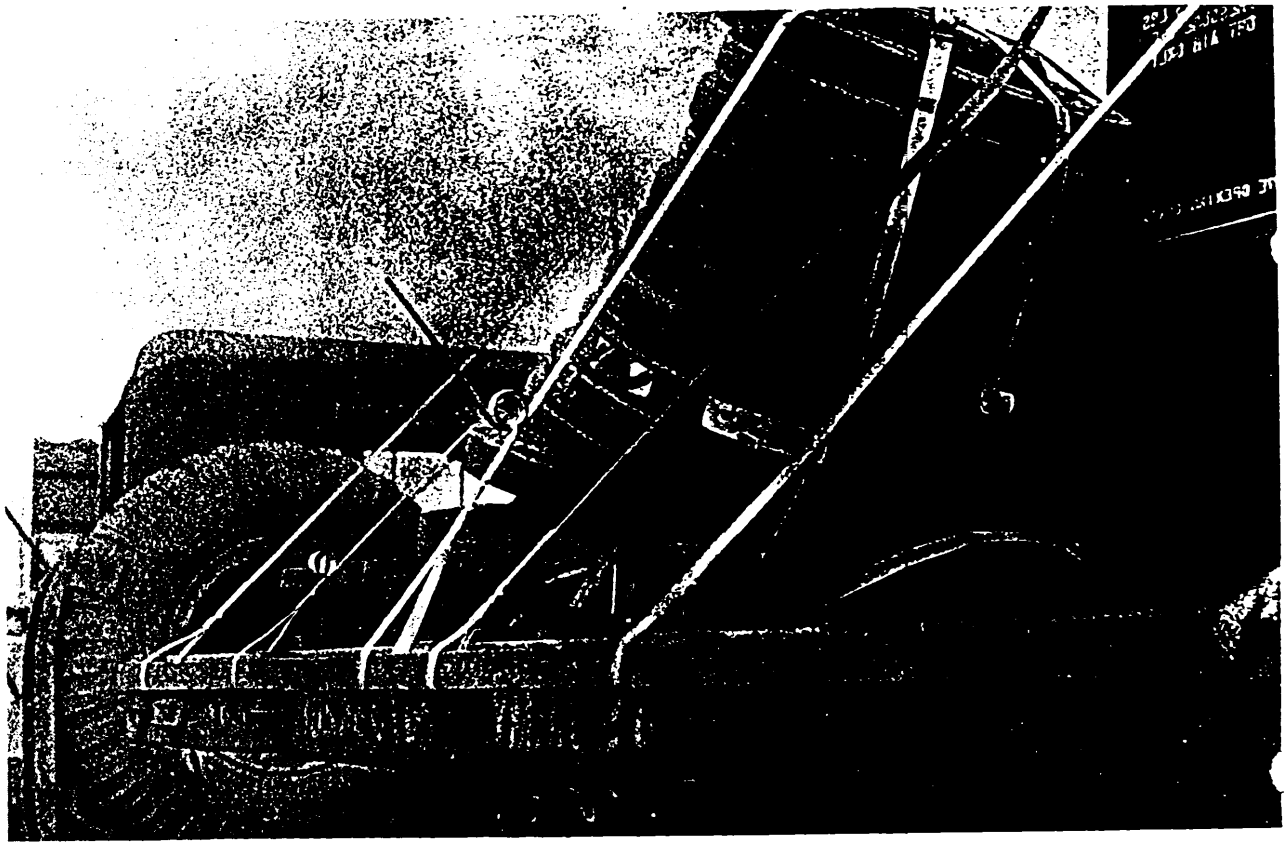


FIGURE **11-20 (U).** Poor Loading.

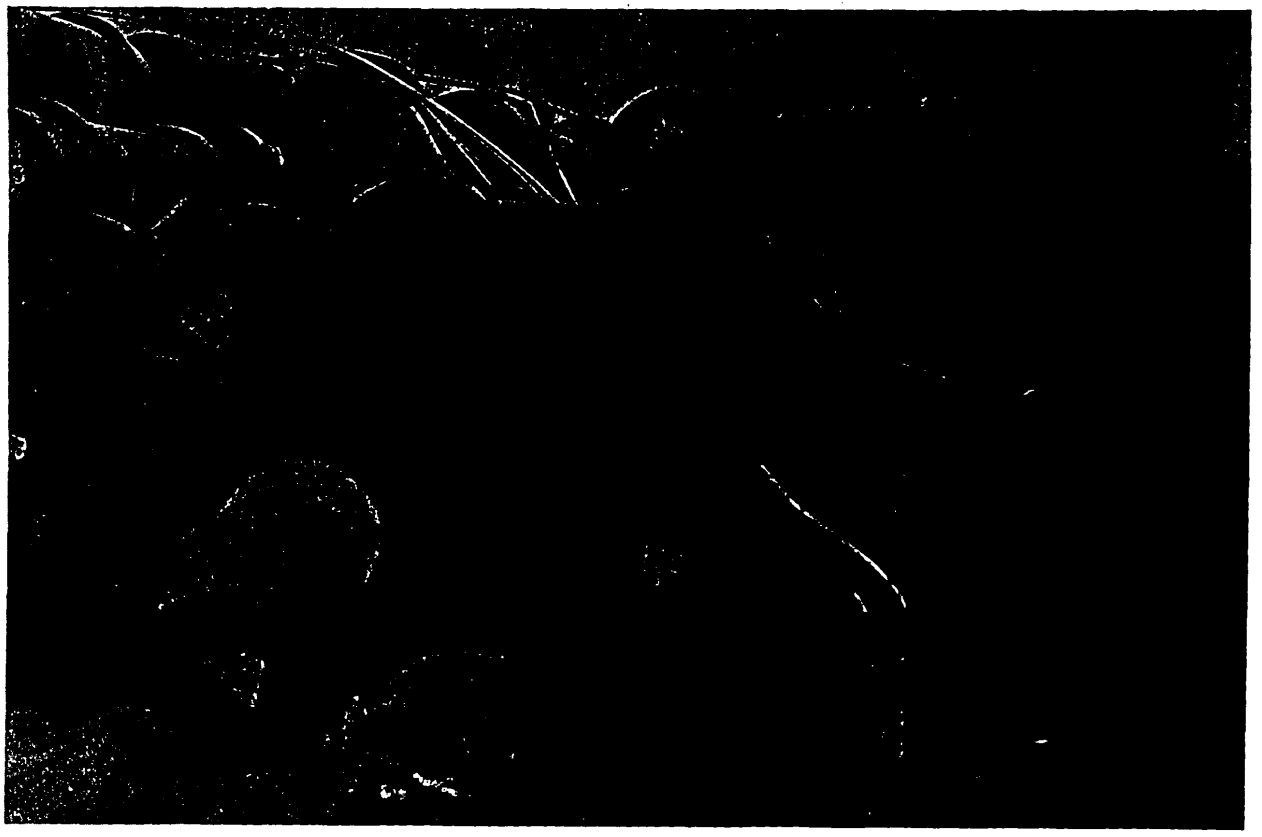


FIGURE **11-21 (U).** Inadequate **Tie-down.**

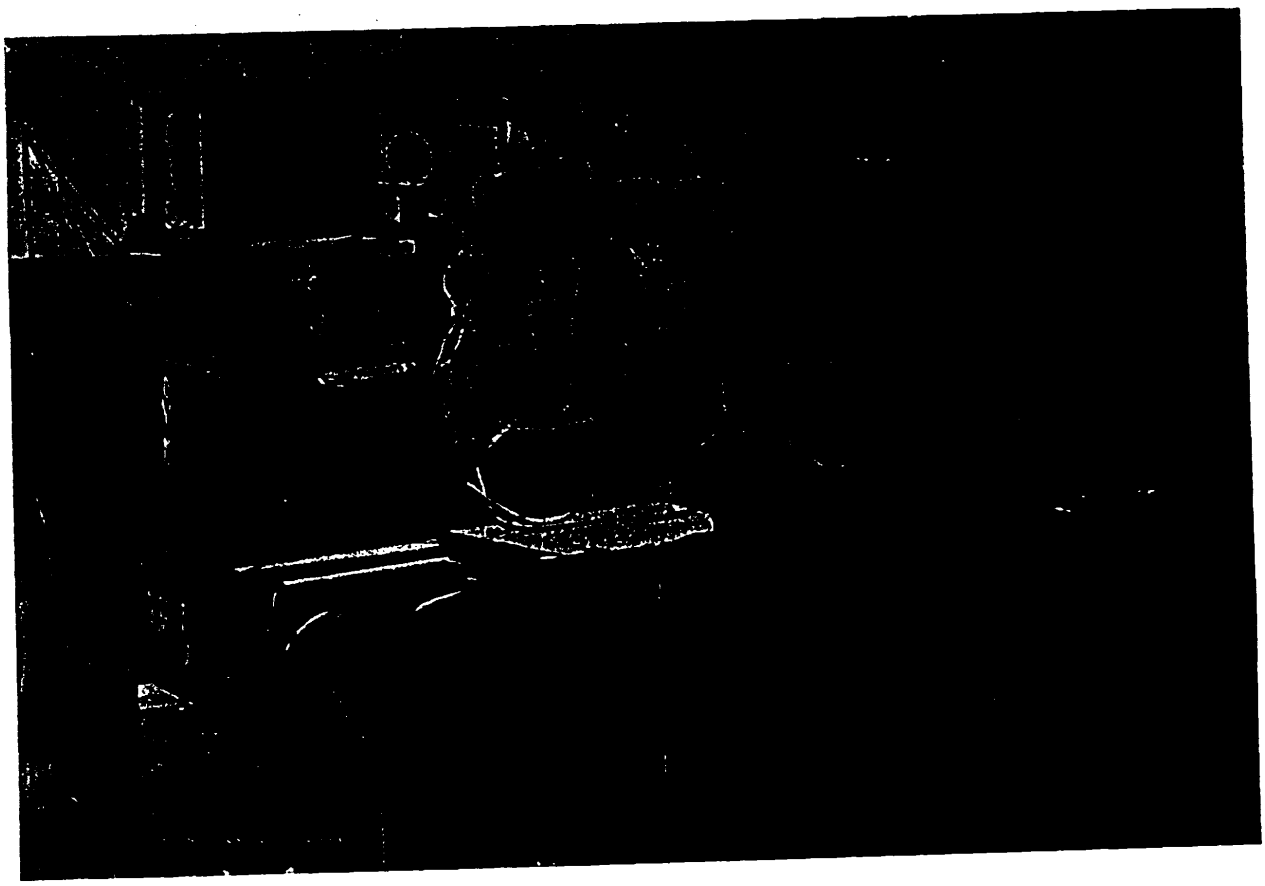


FIGURE II-22 (U). Inadequate Tie-down.

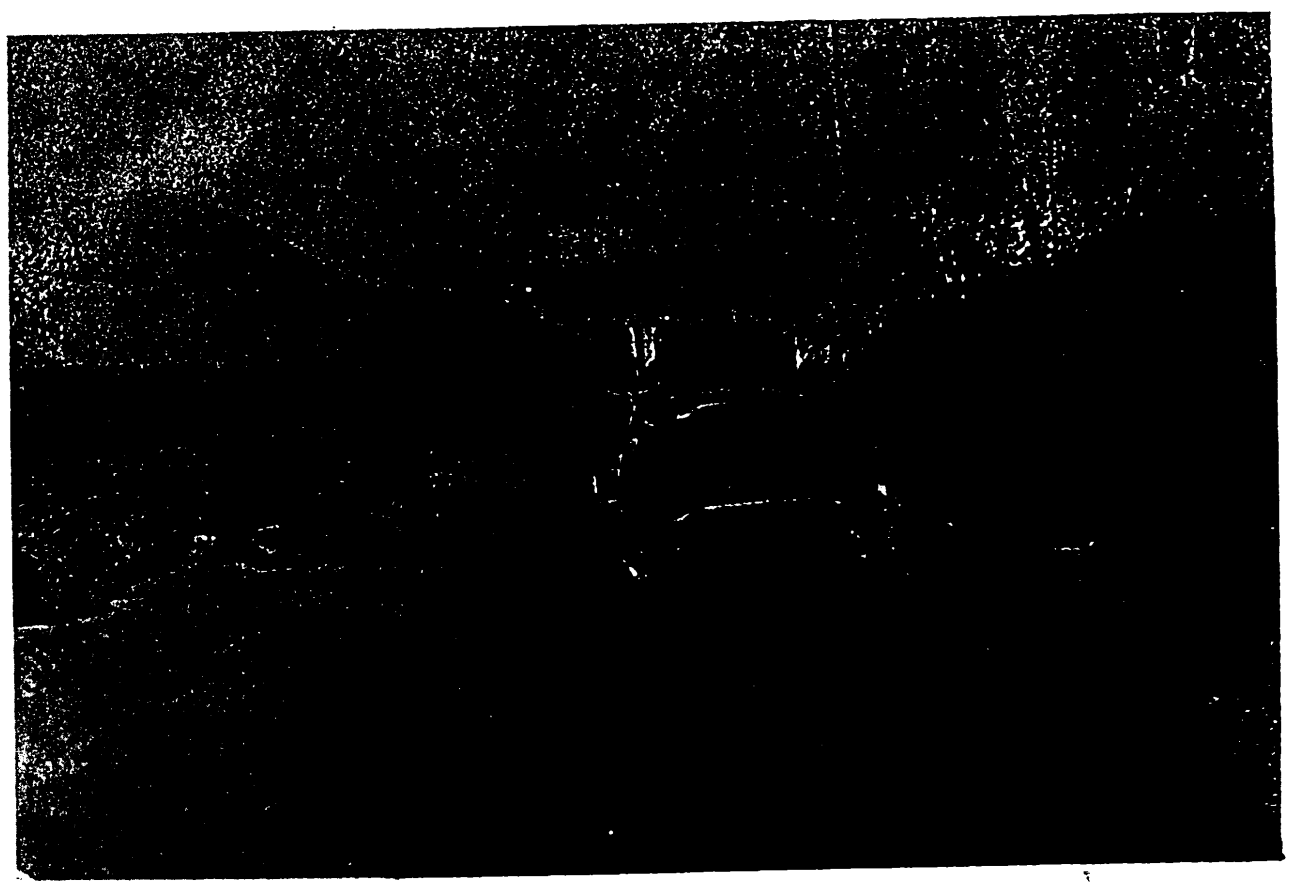


FIGURE 11-23 (U). Rough Roads.

(b). Units rarely used side-boards on the S&P trailers, even when hauling loads which were not palletized (Figures 11-20, 21, and 22). Little protection from the elements was provided. On one occasion the evaluators observed bags of cement being hauled without any cover (Figure II-22), in spite of the fact that a large number of the begs were already hydrated.

(c) Convoy commanders had SOP's for checking, securing or rejecting a load. These SOP's generally appeared to be adequate. However, on some occasions evaluators observed drivers and convoy commanders attempting to reject loads as unsafe, only to be told that these vere high-priority loads and to do the best they could. Frequently these loads came apart and were damaged, as predicted, and a "high-priority load" was partially lost or damaged. Examples observed included a heavy engine block, stacked on top of nested garbage cans, resulting in the cans being crushed; banded rolls of tires hung on the side of the trailer - when the banding and trailer stakes broke, the tires rolled off the trailer and into *the* path of a civilian bus, colliding with that vehicle. Retrograde supplies were observed to be improperly loaded, apparently due *to* inadequate advance planning. An example was the loading of empty powder canisters on S&P trailers, with the only available means of securing the load being chains and binders. Evaluators estimated that one-half of the cargo was lost en route because of the lack of adequate chains or side-boards.

f. FINDING - CBJECTIVE 5

(1) Lend clearing was performed for an average distance of approximately 100 meters on both sides of an LOC [II-5a(1)(a); p. II-36].

(2) Road-clearing and mine-sweep operations were considerably easier along LOC's which had benefitted from land clearing operations [II-5a(1)(a); p. II-36].

(3) Logistical convoys depended almost entirely on other units *to* insure that the LOC's were open and secure [II-5a(2); p. 11-36].

(4) The VC/NVA chose ambush sites which gave them a decided advantage and which placed the target convoy in an unfavorable position [II-5b; p. 11-40].

(5) Ambush action - consisting of the initial shock action, the quick-kill, the mop-up for specific missions, and the withdrawal - normally lasted only 20 to 30 minutes [II-5c(1); p. II-41].

(6) The mere presence of a tactical unit in the *area* did not necessarily mean the area was secure [II-5c(1)(a); p. II-41].

(7) Convoy commanders were generally not involved with the employment of tactical reaction forces [II-5c(1)(c); p. II-41].

(8) Of the 55 aviation units sampled, 59 percent of the units had directly supported convoy operations, while 41 percent had provided little more than "on-call" reaction forces to support any emergency requirement [II-5c(2); p. II-41].

(9) Aviation support was provided through (1) convoy reconnaissance (2) convoy control, and (3) convoy security [II-5c(2); p. II-41].

(10) Based on actual flight time, the O-1 aircraft had provided the greatest amount of direct air support for convoy's particularly in convoy reconnaissance; an estimated 20 percent of available O-1 assets supported convoy operations [II-5c(2)(a); p. II-41].

(11) Helicopter units generally could not provide the great amount of flight time required for direct air support of convoys; therefore, airborne security was provided by helicopter gunship *terns* standing-by either on "strip alert" or as "routine reaction teams" [II-5c(2)(a), (b) and (c); p. II-41 and 42].

(12) The normal reaction time the aircraft on strip alert to become airborne was less than 2 minutes; because the travel time in almost all cases was less than 10 minutes, helicopter gunships were frequently at the ambush site within 10 minutes after the ambush had been initiated [II-5c(2)(b); p. II-42].

(13) Tri-service FAC's in one area called fire-team reaction forces directly and obtained required fire clearances, reducing response time; units providing responsive fire teams in this area were enthusiastic about this procedure [II-5c(2)(c); p. II-43].

(14) Aviation elements were a definite deterrent to enemy action against convoys [II-5c(2)(d)1; p. II-43].

(15) Reconnaissance airplane companies considered the O-1 airplane to be the ideal aircraft for covering convoys [II-5c(2)(d)3; p. II-43].

(16) The mission of the convoy security force was to deter ambushes by its presence and, in the case of an actual ambush, to provide covering fire while the convoy rapidly extricated itself from the ambush site [II-5c(3)(a); p. II-43].

(17) The convoy security forces were not expected to engage the enemy in a fire-fight with intent of destroying the ambush force [II-5c(3)(a); p. II-43].

(18) When subjected to, or aware of, a convoy ambush, the mission of the military police accompanying the convoy was to insure that the convoy kept moving, cleared the kill-zone, and proceeded toward its destination [II-5c(3)(b)3; p. II-44].

(19) Transportation units had developed gun-trucks to augment security forces provided by the military police, and to provide security when operating in areas where military police units were unable to provide escort [II-5c(2)(c); p. II-42].

(20) Planning artillery support along convoy routes was considered desirable, but rarely done [II-5c(4); p. 11-45].

(21) Units in MR's 1 and 2 had hardened vehicles armed with automatic weapons as part of the trail party [II-5d(1)(a)2; p. II-45].

(22) Convoy drivers were observed to be generally lax in dealing with local nationals at convoy halts [II-5d(1)(c) and e(1)(a); p's. 11-49 and II-51].

(23) Secheduled halts were generally at RON sites and were planned to occur at US compounds or fire support bases along the route or at the convoy's destination [II-5d(2); p. II-49].

(24) Vehicle loads were prepared at the depot and were frequently not well secured when picked up by the driver [II-5e(2)(a); p. 11-51].

(25) Adequate tie-downs were not available to the drivers for securing the loads properly [II-5e(2)(a); p. 11-51].

(26) Little protection from the elements was provided for the cargo [II-5e(2)(b); p. II-56].

6. (C) OBJECTIVE 6 - ENEMY ROAD MINING TACTICS, PROCEDURES AND EQUIPMENT USED TO COUNTER THIS THREAT

a. Road Mining History

Historical data on mining incidents in RVN had not been maintained, by any agency, on a level of detail which would allow any valid conclusions to be drawn regarding mining activity directed against convoys. Only very recent records differentiated between on-road and off-road casualties and equipment losses to mines. Although abrupt fluctuations occurred from month to month, these could not be correlated with other events in any way in order to establish meaningful historical/seasonal trends, nor could any other patterns be identified from available data. The most coaplete data available, weekly reports of enemy-initiated incidents occurring along LOC's, were those maintained by USARV Highway Traffic Center; however, interviews wit'? unit commanders and personnel actually maintaining these records indicated that they considered them to be both incomplete and, sometimes, inaccurate in detail. Figures II-24, 25, and 26 were compiled from these records and show highway mining incidents and resulting casualties/equipment losses for June 1970 through March 1971, the only period for which such data were available. In the 10-month period covered, there were 213 mining incidents involving vehicles, which resulted in 175 vehicles being lost (Figure 11-24). Of these, 116 (66 percent) were US vehicles. Of the 121 deaths resulting from these actions, 31 (26 percent) were US personnel. Of the 682 individuals wounded, 229 (33 percent) were US personnel (Figure TI-25). These figures show that, compared to ARVN, US vehicles and personnel were involved in more incidents, but suffered fewer casualities, During the time period shown in Figure 11-25, the enemy attempted to interdict LOC's with mines and/or demolitions on at least 52 occasions. The rate of these incidents fluctuated sharply throughout the period and involved 28 actions against bridges, nine against roads, and 15 against culverts.

b. Extent of Losses Due to Mining

(1) Number of Incidents, by Year

Figure II-27 depicts 2691 mining incidents involving vehicles from January 1967 through December 1970. The record of these incidents was compiled from data acquired from MACV Combined Intelligence Center Vietnam (CICV). The data were derived from daily intelligence summaries submitted by each of the major tactical commands. Incidents were not categorized as occurring on-road or off-mad. While it can be assumed that those involving trucks a d buses were on-road, the same can not be assumed for tanks and APC's. An undetermined number or' the reported incidents-involving such vehicles may have occurred other than on roads. The number of incidents reported does not represent accurately the total number of incidents occurring during this period, but does reflect relative levels of activity within the various military regions.. Incidents generally were higher in MR's 1 and 2

EQUIPMENT		TANKS			APC's			TRKS			JEEPS			DOZERS			GRADES/LOADERS			BUSES			TOTAL
MONTH	US	ARVN	CIV	US	ARVN	CIV	US	ARVN	CIV	US	ARVN	CIV	US	ARVN	CIV	US	ARVN	CIV	US	ARVN	CIV	
JUN 70	1						7	2	1							1					1	13
JULY 70	1			2			7	3	1	1			4			1					2	22
AUG 70	4			3	1		10	5					3			1					2	29
SEP 70	4	1		1			6	1	1	1		2	6			2					1	26
OCT 70	1			2			4	1					1			1						10
NOV 70	1			4	1		9	3													2	20
DEC 70				1	1		2	1	1							1					1	8
JAN 71	1	1			2		3			1						2					1	11
FEB 71				1	1		4	2	2	1						1						12
MAR 71				2	6		6	5	4	1									-			24
TOTAL	13	2	0	16	12	0	58	23	10	5	0	2	14	0	0	10	0	0	0	0	10	175

NOTE: Data **compiled from** USARV **Highway Traffic Center** Data and based **on 213** reported **incidents.**

FIGURE II-24 (C). On-Highway Equipment Losses Due to Mines for the Period June 1970 - March 1971 (U).

		JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
KIA	US	2	3	6	3	0	10	1	1	2	3	13
	ARVN	2	6	2	4	1	8	4	4	2	12	45
	FWF	0	0	1	0	0	1	0	0	0	1	3
	CIV	4	2	2	3	1	4	13	0	7	6	42
SUBTOTAL		8	11	11	10	2	23	18	5	11	22	121
WIA	US	14	32	63	30	12	45	6	4	8	15	229
	ARVN	15	19	43	4	0	63	15	7	0	53	219
	FWF	2	1	8	1	0	6	2	1	0	12	33
	CIV	33	17	1	5	0	24	28	0	21	72	201
SUBTOTAL		64	69	115	40	12	138	15	12	29	152	682

NOTE: Data compiled from USARV Highway Traffic Center Records.

FIGURE II-25 (U). On-Highway Casualties Due to Mines and Boobytraps, June 1970 - March 1971 (U).

	1970							1971			
	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
BRIDGE	3	3	2	0	1	2	4	2	4	7	28
ROAD	1	0	2	0	1	0	1	1	2	1	9
CULVERT	2	0	3	4	2	1	0	2	1	0	15
TOTAL	6	3	7	4	4	3	5	5	7	8	52

NOTE: Data ,compiled from USARV Highway Traffic Center Records

FIGURE II-26 (U). Road Interdiction Incidents, Caused by Explosives, June 1970 - March 1971 (U)

PERIOD	MR 1	MR 2	MR 3	MR 4	TOTAL
JAN - JUN 67	66	22	59	33	180
JUL - DEC 67	232	109	62	66	469
JAN - JUN 68	184	156	128	87	515
JUL - DEC 68	101	71	55	46	273
JAN - JUN 69	22	36	53	41	152
JUL - DEC 69	40	30	135	75	280
JUL - DEC 70		21	127	54	300
		501	854	449	2691

NOTE: Data compiled from MACV Combined-Intelligence Center, Vietnam.

FIGURE II-27 (C). Mining Incidents by Military Region, 1 January through 31 December 1970 (U).

than in MR 3 and MR 4 from January 1967 to December 1968, but fron January 1969 to December 1970 the number of incidents was higher in MR 3 than either MR 1 or MR 2. The number of incidents in MR 4 has remained fairly uniform throughout the entire period.

(2) Geographic Distribution of Incidents

Figures 11-28, 29, 30, and 31 show areas characterized hv heavy, medium, or light concentration of mining incidents, covering 1 January 1967 through 31 December 1970. These maps have been redrawn using overlays provided by the Mine Warfare Center (MWC). Areas of "heavy" mining incidence ere those which were subjected to more than three incidents per kilometer of road during the period. "Medium" areas had one to three incidents per kilometer, and "light" areas less than one incident per kilometer. The statistical input was derived from mine/boobytrap reports (MACV Form 54's) and daily intelligence summaries. The frequency of incidents fluctuated, but interviews with engineer units revealed that the relative levels of activity of the mined areas remained constant. An exception to this was during operation LAMSON 719 (Figure II-29), when, due to the action in Laos, both enemy and friendly activity greatly increased in the western portion of MR 1, and the frequency of mining incidents rose appreciably.

(3) Equipment Losses, by Year

Figures 11-32, 11-33, 11-34, and 11-35, depict 2,795 US, FWMAF/ARVN, and civilian vehicles involved in mining incidents from 1 January 1967 through 31 December 1970, by MR. The figures xere compiled using data obtained from CICV. Although not shown in these figures, the rate of losses to mines throughout RVN peaked in mid-1970. Figure 11-36 shows item density in USARV, total combat losses, and mine losses for certain types of key equipment for the period from 1 November 1967 thru 31 December 1970. This information was secured from MWC and had been originally obtained from the Inventory Control Center Vietnam (ICCV). Analysis of these figures shows that a large percentage of combat losses of key equipment is due to mining. Mines were responsible for over 80 percent of all combat losses in 1970 for six major end-item, end accounted for 68 percent of all combat losses for the total of eleven major end-items listed.

(4) Personnel Losses, by Year

Figure 11-37 shows total USARV casualty data for the years 1967 through 1970, obtained from the Mine Warfare Center. Mine and boobytrap figures are included in the totals. The peak total casualty figures appear in 1968, while the largest number of casualties from mines and boobytraps occurred in 1969. In 1970, when US casualties were the lowest (only 56 percent of 1969 totals, and less than half of those recorded in 1968) the percentage caused by mines/boobytraps jumped to over 25 percent. Figure II-38 shows casualty figures for US, ARVN, and civilians as a result

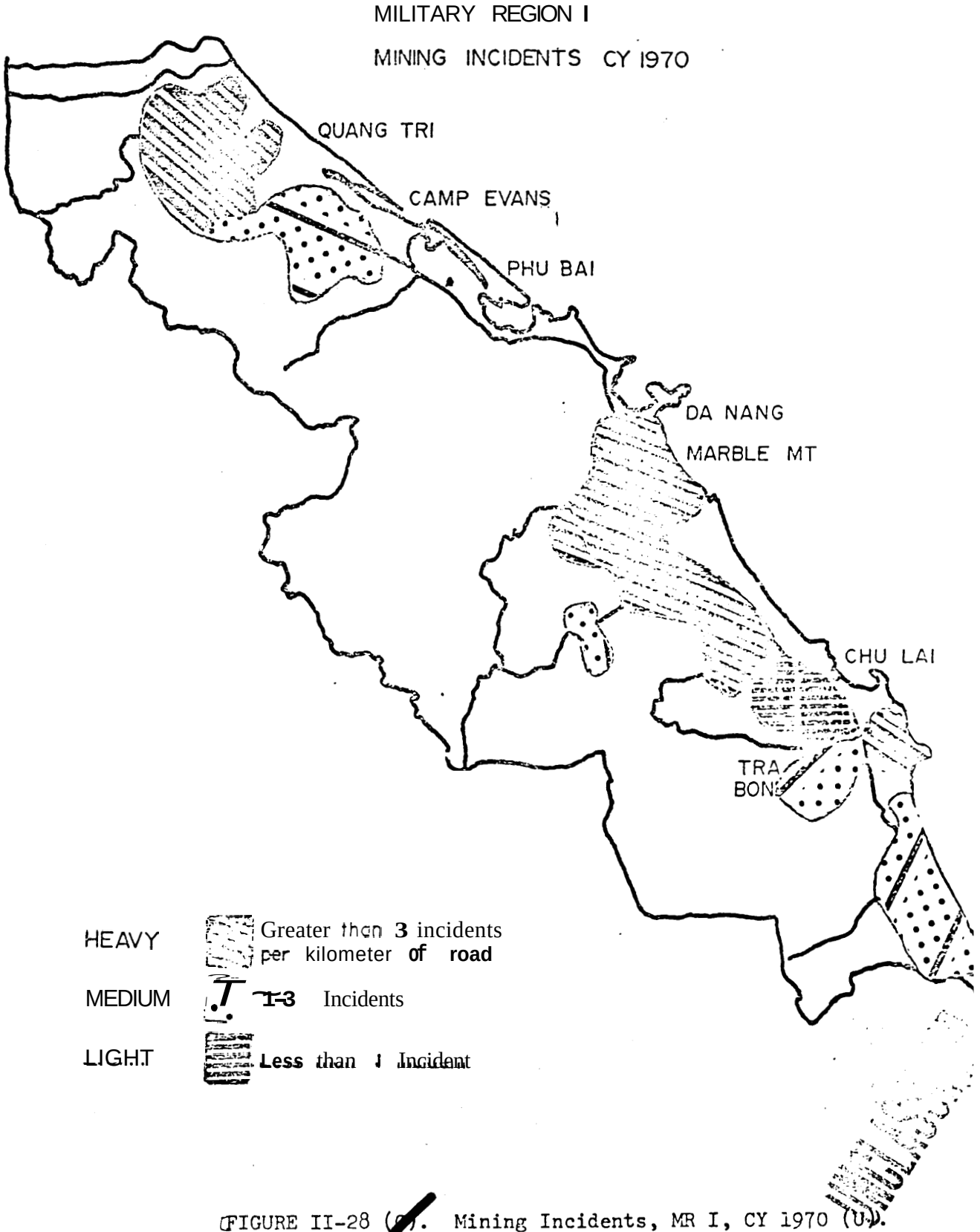


FIGURE II-28 (C). Mining Incidents, MR I, CY 1970 (U).

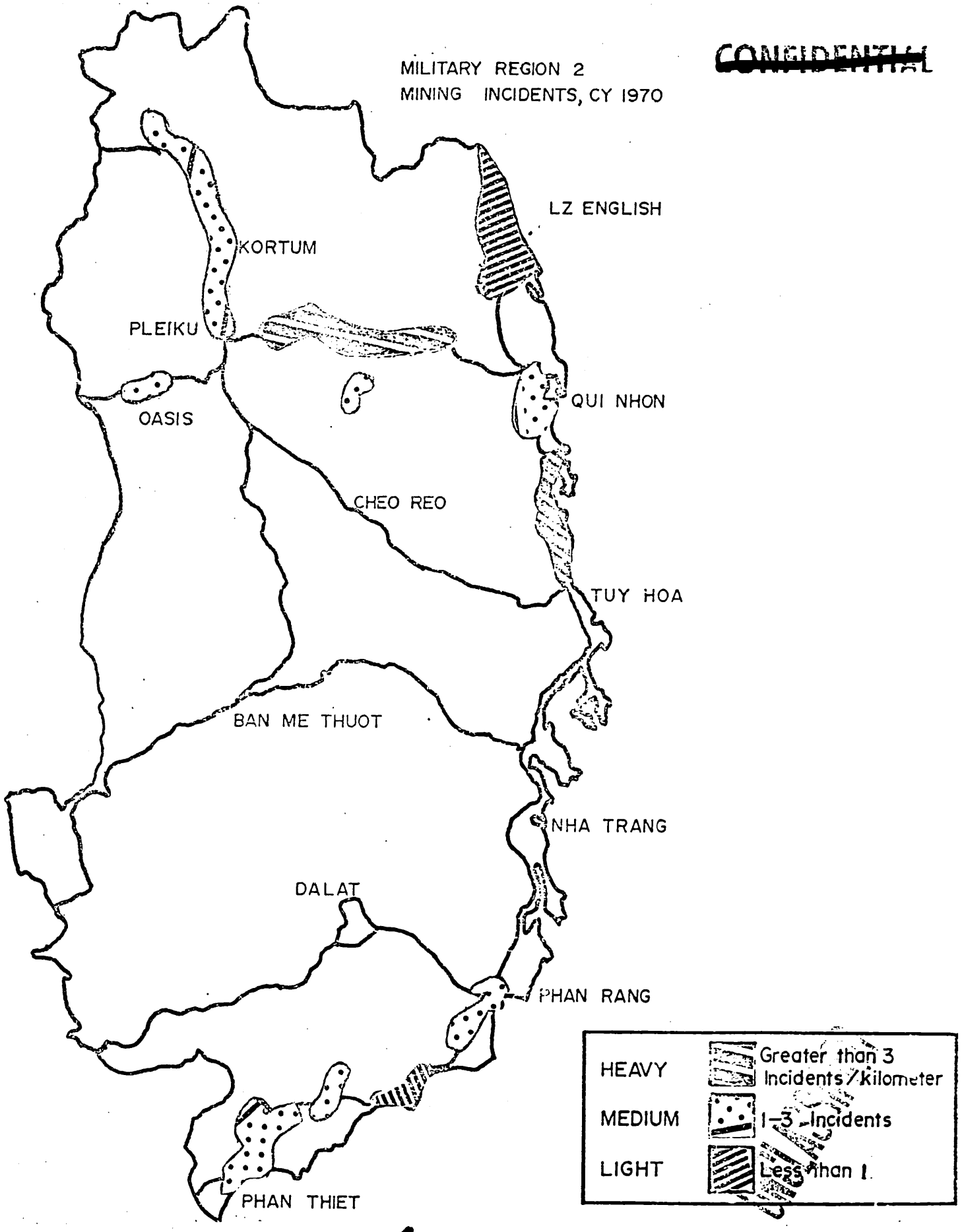


FIGURE 11- 29(C). Mining Incidents, MR 2, CY 1970 (U).

MILITARY REGION 3

MINING INCIDENTS, CY 1970

CONFIDENTIAL

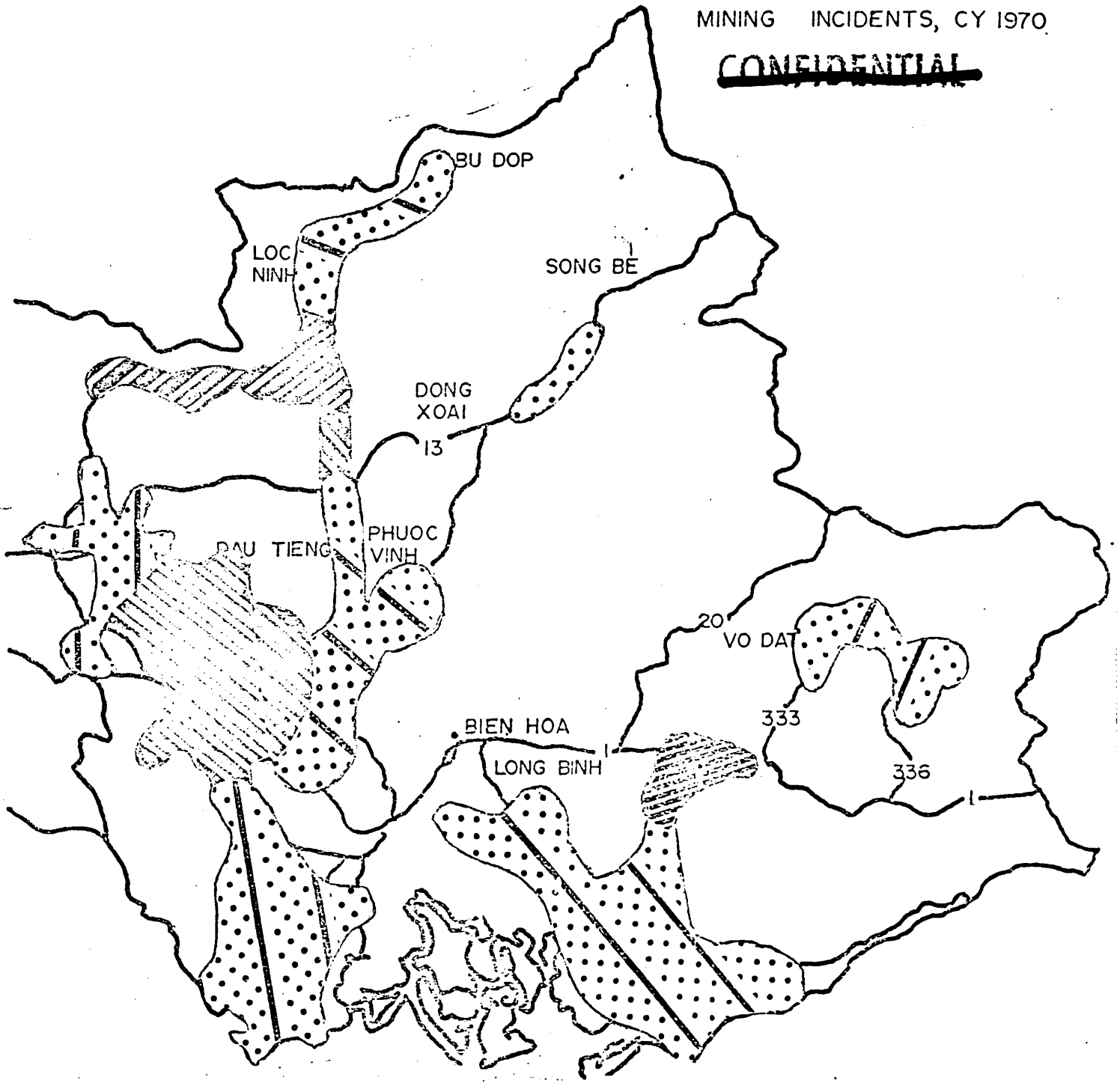


FIGURE II-30 (U). Mining Incidents, MR 3, CY 1970 (U).

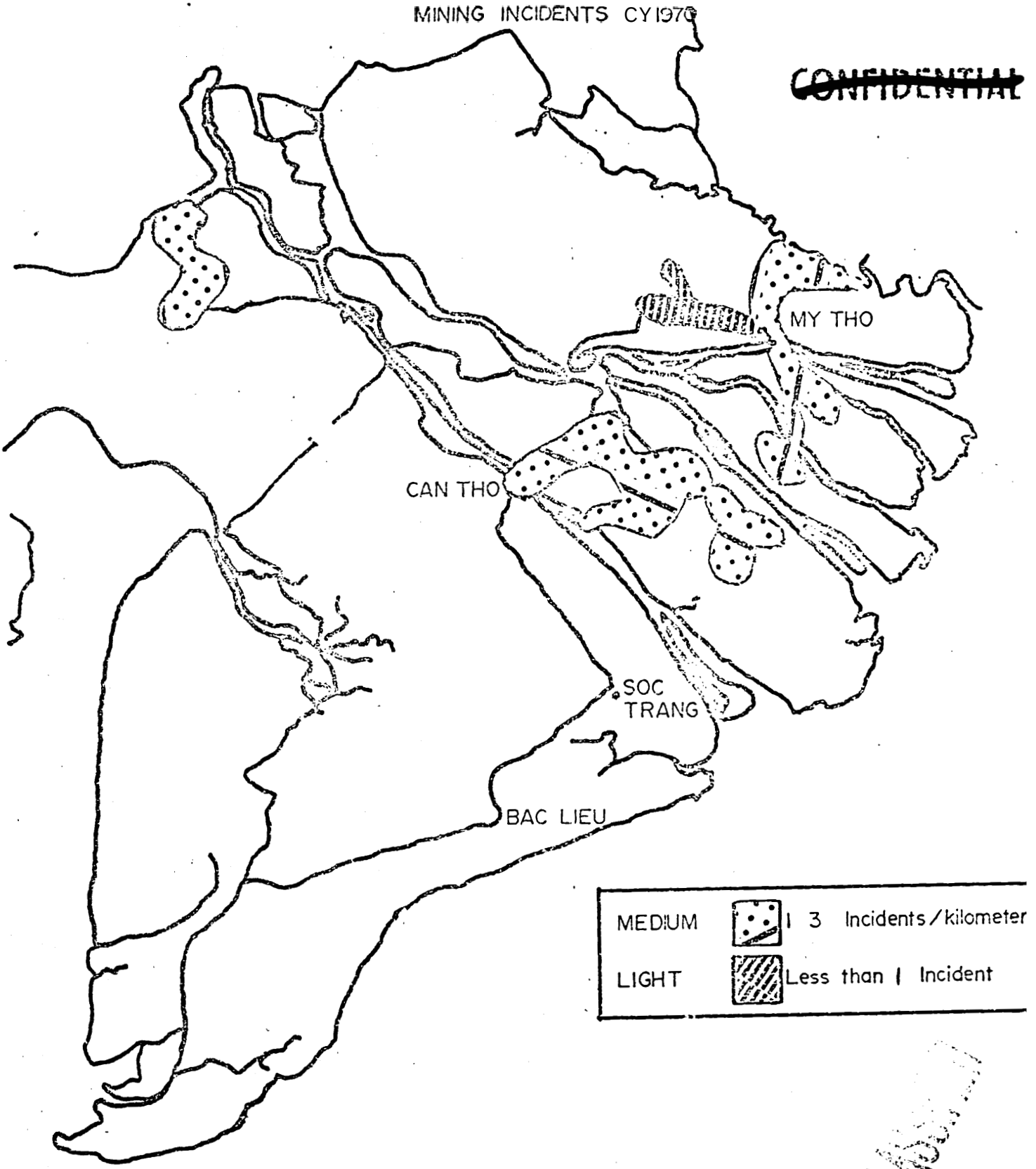


FIGURE II-31 (C). Mining Incidents, MR 4, CY 1970 (U).

TYPE EQUIPMENT	MR I FWMAF US	ARVN	CIV	MR II FWMAF US	ARVN	CIV	MR III FWMAF US	ARVN	CIV	MR IV FWMAF US	ARVN	CIV	TOTAL FWMAF US	ARVN	CIV
TANKS	22			5	4		3						30	4	0
APC	24	2		12	1		10	13		2	6		57	22	0
TRKS	127	46	21	32	38	24	22	30	19	5	27	41	186	141	105
JEEPS	9	5	3	3	1	2	7	6		4	3	3	23	15	8
DOZERS	5	2		4	3		2						11	5	0
EARTH MOVERS	1												1	0	0
CRANES	1												1	0	0
BUS			25			11			4			8	0	0	48
MOTOR CYCLES			2						2				0	0	4
FROUT LOADER	1												1	0	0
GRADER				1									1	0	0
TOTAL INCIDENTS	269			141			120			99			662		

NOTE: Data obtained from MACV-CICV.

FIGURE II-32 (C). Equipment Involved in Mining Incidents - CY 1967 (U).

TYPE EQUIPMENT	MR I FWMAF US	MR I FWMAF ARVN	MR I FWMAF CIV	MR II FWMAF US	MR II FWMAF ARVN	MR II FWMAF CIV	MR III FWMAF US	MR III FWMAF ARVN	MR III FWMAF CIV	MR IV FWMAF US	MR IV FWMAF ARVN	MR IV FWMAF CIV	TOTAL FWMAF US	TOTAL FWMAF ARVN	TOTAL FWMAF CIV
TANKS	24			17			6						47	0	0
APC	41	3		56	1		75	6		3	3		175	13	0
TRKS	119	24	17	64	29	21	25	24	16	12	20	13	220	97	67
JEEPS	5	2		6	1		3	2		1	1		15	6	0
DOZERS	9	1		3			3						15	1	0
EARTH MOVERS	1			2									3	0	0
CRANES	4	1											4	1	0
BUS			32			25			23			38	0	0	118
MOTOR CYCLES													0	0	0
FRONT LOADER				1									1	0	0
GRADER	1			1									2	0	0
TOTAL INCIDENTS	284			227			183			91			785		

NOTE: Data obtained from MACV-CICV..

FIGURE II-33 (U). Equipment Involved in Mining Incidents CY 1968 (U).

TYPE EQUIPMENT	MR I FWMAF US	ARVN	CIV	MR II FWMAF US	ARVN	CIV	MR III FWMAF US	ARVN	CIV	MR IV FWMAF US	ARVN	CIV	TOTAL FWMAF US	ARVN	CIV
TANKS				1			22						23		
APC	12	4		9	4		67	11			3		88	22	
TRKS	19	7	5	10	18	7	15	26	19	5	41	12	48	92	43
JEEPS		1	1	2	3	1	3			11	8	3	16	12	5
DOZERS		1					9			3	3		12	4	
EARTH MOVERS															
CRANES															
BUS			11			11			13			33			68
MOTOR CYCLES			1						1			1			3
FRONT LOADER															
GRADER															
TOTAL INCIDENTS	62			67			186			723			438		

NOTE: Data compiled from MACV-CICV.

FIGURE II-34 (C) Equipment Involved in Mining Incidents - CY 1969 (U).

TYPE EQUIPMENT	MR I FWMAF US	ARVN	CIV	MR II FWMAF US	ARVN	CIV	MR III FWMAF US	ARVN	CIV	MR IV FWMAF US	ARVN	CIV	TOTAL FWMAF US	ARVN	CIV
TANKS	59	14		6			65	4		2			132	18	0
APC	113	7		12	6		138	25		9	12		272	50	0
TRKS	15	12	7	15	15	11	45	36	14	5	57	19	80	120	51
JEEPS	5	2	1	1	3		3	9		8	7	2	17	21	3
DOZERS	1				12						8		16	8	0
EARTH MOVERS													0	0	0
CRANES													0	0	0
BUS						8			9			10	0	0	29
MOTOR CYCLES													0	0	0
FRONT LOADER													0	0	0
GRADER							2						2	0	0
TOTAL INCIDENTS	241			77			362			139			819		

NOTE: Data compiled from MACV-CICV.

FIGURE II-35 (U). Equipment Involved in Mining Incidents - CY 1970 (U).

ITEM	USARV ITEM DENSITY AS OF DEC 69	TOTAL COMBAT LOSSES	LOSSES TO MINES	PERCENTAGE MINE LOSSES TO COMBAT LOSSES
CARRIER, CARGO	366	65	45	69
CARRIER, ARMD PERSONNEL	1537	2007	1579	79
LOADER, SCOOP	404	11	4	36
TANK, COMBAT M-48	355	444	329	74
TRACTOR, F.T., DSC	592	139	116	84
TRUCK, 1/4 TON	13,556	349	109	31
TRUCK, 3/4 TON	10,768	256	99	39
TRUCK, 2 1/2 TON	14,296	398	200	51
TRUCK, 5 TON	6,832	669	379	57
TRUCK, 10 TON	613	44	27	61
SHERIDAN, M551 (MAR 70-DEC 70)	0	105	83	84

NOTE: Data compiled from Engineer Command Mine Warfare Center, USARV (U).

FIGURE II-36 (C). Battle Losses of Key Equipment - 1 November 1967 through December 1970.

	KILLED IN ACTION			WOUNDED IN ACTION		
	TOTAL FATAL CASUALTIES	M/BT's	PERCENT M/BT's	TOTAL NONFATAL CASUALTIES	M/BT's	PERCENT M/BT's
1967	5,232	375	7.2	34,625	3,878	11.2
1968	9,161	758	8.3	59,858	5,095	8.4
1969	6,537	923	14.1	49,836	7,491	15.0
1970	2,748	704	25.6	28,774	6,550	25.4
TOTALS	23,678	2,760	11.6	173,093	27,014	15.4

NOTES: 1/ Data obtained from USARV, MWC.

2/ M/BT's = Mines/Boobytraps

FIGURE II-37 (C). Percent of USARV Casualties Due to Mines/Boobytraps (U).

			1967	1968	1969	1970
MR 1	US		29	41	8	33
		WIA	74	177	118	487
	ARVN	KIA	57	22	13	29
		WIA	95	112	95	166
	CIVILIAN	K	113	163	82	27
		W	261.	288	97	50
MR 2	US	KIA	6	19	13	10
		WIA	39	209	78	38
	ARVN	KIA	40	20	34	23
		WIA	76	134	101	115
	CIVILIAN	K	75	160	56	71
		W	46	227	109	94
MR 3	US	KIA	19	36	22	9
		WIA	128	339	210	266
	ARVN	KIA	62	46	47	42
		WIA	78	133	162	232
	CIVILIAN	K	51	149	115	48
		W	74	211	189	114
MR 4	US	KIA	3	20	9	3
		WIA	20	44	32	20
	ARVN	KIA	58	8	21	48
		WIA	83	81	192	224
	CIVILIAN	K	117	139	164	42
		W	120	253	344	79

NOTE: Data obtained from MACV-CICV

FIGURE 11-38 (U). CICV Casualties Due to Mines/Boobytraps.

of mining incidents. These figures were compiled from data acquired from CICV.

c. Enemy Tactics and Techniques

(1) Types of Mines and Fuzes

Information pertaining to enemy tactics and techniques is well documented. Unless otherwise indicated, the information used herein was extracted from DA TC 5-31 (see paragraph I-1, reference d) and CICV TIS-1 (see paragraph I-1, reference e).

(a) The NVA/VC employed a wide variety of mines. The types varied from area to area within Vietnam depending on availability through supply channels from North Vietnam (NVA); local storage of captured US or allied mines: access to scavenged allied explosives, shells, bombs, and firing devices; and the capability of local VC to manufacture or improvise. The mines used can be classified as manufactured metallic, manufactured nonmetallic, improvised metallic, and improvised nonmetallic.

(b) One Soviet-manufactured metallic antitank mine used by the eneny was the TM-41. This was a cylindrical, blast-type mine weighing twelve pounds, eight pounds of which consisted of explosives. The mine was so designed that pressure of approximately 350 lbs. from above would crush the corrugated sides of the lid, depressing the pressure cap of the MV-5 fuze until it detonated the mine. Another metallic, manufactured nine in use was the Soviet TM-46, a circular, blast-type mine with a sheet-steel casing. It contained 13 pounds of TNT and required 400 lbs. of pressure to crush the casing and activate the MV-5 fuze. The enemy also employed the Chinese Communist (Chincom) copy of the US M1A1 AT mine. Approximately 200 lbs, on the spider pressure plate would detonate this nine.

(c) In addition to these manufactured examples, the enemy improvised metallic mines. One type was made from US artillery and mortar projectiles. The projectile fuze was removed and a hole drilled into the explosive to accept a fuze. The nine was then rigged for detonation by either command or pressure.

(d) When used in an antivehicular role, a "slap stick" firing device (Figure 11-39) was most often used. This improvised device consisted of two wooden slats or pieces of bamboo, two blocks of wood, two metal contacts, rubber strips, a battery pack, electric blasting and electric wire. When a vehicle passed over the device, the two metal contacts came together, completing the electrical circuit which fired the electrical blasting cap and main charge.

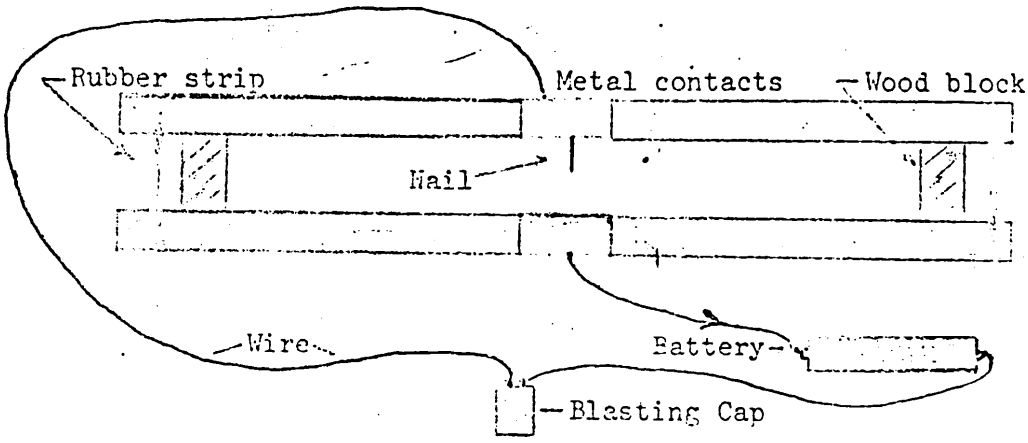


FIGURE II-39 (U). "Slap Stick" Firing Device.

(e) Allied ordnance such as artillery projectiles, mortar rounds, and bombs were relatively easy for the enemy to acquire. CICV documents revealed that the VC/NVA had assigned individuals who policed areas immediately after a shelling and collected all unexploded rounds. Unused rounds were also acquired from abandoned FSB's and black market sources. CICV documents revealed that the enemy also collected explosives from dud bombs. Mines using this explosive were then constructed in cylindrical sheet-metal casings.

(f) One manufactured nonmetallic mine found and reported by engineers was the East German PM-60. The TNT explosive composed the bulk of the total weight of 25 lbs. This mine was made of a black, plastic-like material and required an activating force of approximately 400 lbs. The pressure cap was of bakelite, and the plunger and the ball retaining collar were aluminum. The only ferrous-content parts were in the fuze mechanism (plunger-retaining spring, striker, striker spring, and two striker retaining balls).

(g) The enemy also improvised nonmetallic mines, wrapping explosives (e.g., US-C4, Chicom TNT, Nitro Starch, Chicom Composition B) in a burlap or plastic wrapper, or sometimes packing them in wooden boxes. A slap-stick firing device was ettached and resulted in a very effective nine. with few metal parts. The most common sizes were between 20 and 30 lbs.

(h) Interviews with engineer units revealed that the enemy rigged very few mines fcr command detonation, although many of their mines were capable of being command-detonated.

(2) General Employment

(a) The enemy employed a wide range of mining tactics. Interviews with engineer units revealed that methods of employment varied from area to area, depending upon the ingenuity of the particular enemy unit and

the local availability of nines and/or materiels. Methods were relatively uniform throughout each given area. Engineer units stated that mines were emplaced on the traveled way, on the shoulder, in the ditch line. in potholes, or in culverts, and that placement varied widely, even within a given area. The enemy usually attempted to restore the emplacement site to its original appearance after emplacing a nine. This was more successful on the shoulder, in the ditch, or at turnoffs than it was on the roadway itself, even in the case of unpaved roads. Implanting the mine over a metal culvert was an effective tactic. On an unpaved roadway, normal ruts and tracks were reconstructed in order to hide the mine. Some engineer units made this type of camouflage more difficult by rolling the road in the evening with a pneumatic-tired roller or other rolling device, sometimes adding a layer of peneprime (liquid asphalt), as this made it more difficult for the enemy to disguise the fact that the roadway had been tampered with.

(b) According to documentation and interviews, the number of mines emplaced followed a set pattern. In some areas the enemy consistently planted only a single mine. In some other areas, mines were always found in groups of three, 20 to 30 meters apart. In some areas where multiple mines were the rule, they were usually grouped so as to complement each other. The secondary mines were usually found in likely by-pass locations, and/or in locations nearby where recovery vehicles would be likely to maneuver in recovering a vehicle damaged by the primary mine. Mines were stacked in some areas, being buried one atop another to increase the explosive force. Information on the frequency of boobytrapped mines was meager. The majority of mines detected were exploded in place, destroying any evidence of booby-trapping. Of those that were recovered only a few were found to have been boobytrapped. Occasionally mines were employed as demolition ordnance, solely to interdict an LOC. in these cases, culverts were usually selected as the target, since culverts offered maximum results for the amount of ordnance expended, and because damaged culverts were more difficult to repair than was damage to merely the road itself. Enemy tactics included various fuzes to counter deliberate mine sweeps (a sweep usually employed several means of detection and was carried out by dismounted personnel). One method noted was that the enemy dug a hole, covered it with a board and applied camouflage; only after the sweep team passed was the mine emplaced. A variation was to emplace a nonmetallic mine without the fuze (the only portion containing magnetic-detectable perts), which could be easily installed after the sweep passed. Security was sometimes posted after the sweep to deny the enemy such an opportunity to mine the swept road.

(c) Enemy training documents stressed the advantages offered by wet roadways; the mine could be enclosed in waterproof material and placed in mud holes. When emplaced under a mud puddle, the mine was often buried at a depth greater than 36 inches, supported by boards to insure that it did not sink further. Documents shoved that the Viet Cong often mined the same sections of roads on a recurring basis.

(3) Use of Ambushes

As discussed in paragraph I-6, there was little "hard" evidence available to identify enemy mining activity as being directed solely against convoys. There was even less information to indicate enemy use of mines in conjunction with deliberate ambushes. However, there were some recorded instances where mines, pressure- or command-detonated, were used to initiate an ambush. As mentioned earlier, multiple mines were often emplaced to complement each other. To by-pass a mine-damaged vehicle, another driver risked detonating a second mine. Only one engineer unit reported a convoy's being mined/ambushed after the unit had swept the road. The mine was command-detonated against a 5-ton truck during a small, unsuccessful ambush. It was the consensus of the unit that their sweep conducted earlier had missed the mine. Two units reported sweep teams themselves being ambushed by mines. In each instance the mines were antipersonnel claymore mines presumably intended for use against the sweep teams. One unit also reported heavy sniper fire in mined areas, especially after a mine was located by the sweep team. The unit believed these to be harassing tactics used in an attempt to lessen the team's effectiveness in locating other mines in the area.

(4) Use of Paved Roads

(a) As of 1 August 1970 there were 1,762 kilometers of paved LOC's in South Vietnam, with 1,910 kilometers due to be paved during FY 70 and beyond, according to figures released by the US Army Engineer Command, Vietnam (USAECV). Three engineer units indicated that there were roads in their AO's where mining incidents had been significantly reduced as a result of paving. They stated that the VC could not effectively emplace mines in the surface and had had to resort to emplacements on shoulders and in culverts. One unit had experience with the enemy's cutting plugs from the pavement, emplacing a mine, and replacing the plug. These mines were easily detected visually, because the enemy had covered the plugs with dirt. Mines were also emplaced under the pavement by tunneling in from the edge. Continuous road maintenance denied the enemy an opportunity to place mines in potholes.

(b) The following enemy doctrine is recorded in CDEC LOC number 04-337-67 (see paragraph I-1, reference aa): "When digging a hole in an asphalt road, it must be covered with a piece of asphalt if available. Use a thin board or bamboo wattle covered with asphalt or olive oil mixed with cinders. ..sprinkle pebbles end sand over it."

(c) An example of the effect of road paving on mining activity contained in volume 7 of the SECMA report (see paragraph I-1, reference dd) stated that during the period 17 June 67 through 10 April 68, 56 mine incidents were reported on the unpaved road section of QL-19W near Pleiku. Engineer units were upgrading and paving the unpaved section QL-19W during this period, and mining incidents continued to occur on the unimproved section of the road while the paving operation was progressing. After the

paving operation was completed on 29 April 1968, only one further incident was reported on the paved section of the road through 12 Jun 68. The unpaved QL-19W had a rate of 5.6 incidents per month, while the paved QL-19W had a rate of 0.5 incidents per month.

(d) One example of the tactics employed was an incident that took place in Quang Ngai Province on 14 August 1970. An antitank cline was command-detonated on the access road to an FSB. Three friendly soldiers were killed and twenty-eight were wounded. The capture and subsequent interrogation of a suspected accomplice provided the following information: The mine wes an improvised, 40-lb., wood-encased antitank mine, emplaced under the paved surface of the road by removing base rocks from the shoulder of the road directly above a culvert and digging an inclined hole to the desired location; the hole had then been filled with rocks, dirt, and liquid asphalt, and the mine command-detonated from a position 100 meters from the road. The mine had been emplaced during the day, the activity concealed by a large group of Vietamese civilians loitering in the area. The suspect further stated that this technique was being employed along QL-1.

d. Procedures Used in Countering Mine Threat

(1) Preventive Measures

(a) Surveillance

Post-mine-sweep surveillance methods used to deter enemy mining activity were dependent on several factors, including the level of enemy threat, road traffic subsequent to the mine sweep, extent of ARVN support, availability of security vehicles, length of road involved, and terrain features. Interviews revealed that at least three of the fourteen engineer units contacted did not employ surveillance of any type after a mine sweep. Instead, they depended upon the factors of normal traffic and the civil populace to deter the enemy from post-sweep (daylight) mining activity. The following types of surveillance were also employed: free flow of traffic; occasional helicopter overflights; security elements at work sites; ARVN and US patrols; and ARVN outposts along the route. One example of intensive road surveillance, however, was enployed by a unit in MR 2; in one area they had eight M-42 self-propelled 40mm guns (Dusters) near work sites, five gun-trucks on a 5-8 km roving patrol, and three platoons of ARVN in scattered outposts along the route. On another section of the same road, the unit employed a troop of ARVN Cavalry, with 15 APC's, and a company of ARVN Rangers. The Cavalry and Rangers were staggered on each side of the road. Night surveillance was limited to ARVN outposts, sometimes aided by civilians from the villages who reported enemy activity. Interviewed units suggested that all civilians on the road at the time of a mine sweep be observed and inspected. The units also suggested increased use of sensors in areas with a high mine-incident rate. In addition, these units recommended issue of night observation devices to ARVN outposts along the roads.

(b) Land Clearing

1. A tactical land-clenring operation is a combat support operation which is designed to deny the enemy cover and concealment in critical areas. A well-planned clearing operation will accomplish at least some of the following objectives:

a. Deny the enemy cover and concealment

b. Canalize the enemy's infiltration and movement

c. Deny the enemy concealed base areas

d. Deny the enemy ambush sites adjacent to LOC's

e. Provide clearance for visual and radar observation

f. Provide observation and fields of fire for perimeter defense (see paragraph I-1, reference bb).

2. Transportation units felt that clearing both sides of an LOC for a hundred meters was a major deterrent to enemy ambush activities. Examples of this were found on QL-1 from Xuan Loc to FSB Mace; in that area, little or no enemy interdiction had taken place since land clearing and paving had been completed. On the other hand, on QL-9 from LZ Vandergrift to Khe Sanh, on which land clearing had not been undertaken, ambushes were a daily occurrence during LAMSON 719.

3. Land clearing was not conducted on all roads, the availability of the necessary equipment being a major constraint. One unit complained of cultivated crops growing too close to the road, which they did not have permission to clear. Eight of the 34 Engineer units contacted had cleared all land bordering LOC's in their AO's. Preventing regrowth was a major problem and units stated that new growth should be cleared every year. Two units burned off new growth during the dry season.

4. Opinions on the effectiveness of land clearing in countering the mine threat were mixed. A negative statement coming from one unit was: "Not effective; the most heavily mined area is in a location that was cleared less than six months ago." A consensus in four units was that land clearing was advantageous in mine sweep operations because it denied enemy sniper and ambush parties positions close to the road. These personnel indicated that they believed the enemy's accuracy and effectiveness to be impaired by added stand-off distances.

(c) Interdiction

Various methods of interdiction were used by engineer units in an attempt to deter enemy mining. Interviews conducted in 15

engineer units disclosed the following types: ARVN ambush patrols along roads and likely avenues of approach; both manned and mechanical ambushes; flank sweeps; artillery aerial bursts and white phosphorous (WP); random "mad" minutes (the firing of all available weapons); and tracked-vehicle runs. According to the units, these methods were only partially successful. As was found to be the case with surveillance, interdiction was limited by resources available.

(d) Volunteer Informant Program

1. The Volunteer Informant Program (VTP) was a country-wide MACV program to encourage Vietnamese civilians to volunteer useful infomation on enemy activities for monetary rewards. The objectives of the program as outlined in MACV Dir 381-2, were to:

a. assist commanders in acquiring information that will help them accomplish their mission;

b. furnish protection to friendly forces and facilities by providing advance warning of enemy intentions and activities, particularly with respect to impending rocket, mortar, artillery, and sapper attacks;

c. decrease enemy capability to employ mines and demolitions against friendly personnel and vehicles and otherwise disrupt LOC's;

d. develop reliable new sources of information;

e. create anxiety and uncertainty among the enemy regarding the adequacy—of his own security.

2. A commander of a division-size unit reported the following an its VIP: "Use is made of leaflets, loudspeaker broadcasts, and face-to-face persuasion. It has been observed that children are more easily aligned to the VIP than are adults. Of significance is the fact that there is a direct relationship between the number of VIP PSYOP missions conducted and ths appreciable results." This division paid cash rewards for information as well as for weapons and explosive devices turned in by local nationals.

3. One of the engineer brigade commanders stated that, as a nondivisional unit commander, he at times had difficulty obtaining the money to support the VIP. He also felt that *the* best method was to have the money in the possession or the mine sweep team leader for on-the-spot payment.

4. One engineer battalion just starting a VIP was planning to give excess materials in lieu of money in payment for mines, munitions, and information.

5. An evaluation of the VIP as it existed in 1968 can be found in Volume 7 of the SECMA report (see paragraph I-1, reference dd).

(2) Detection Methods and Equipment

(a) Visual Detection

1. Interviews revealed that visual detection of mines ranged from a small percentage of total detections in some areas to 100 percent in other areas. The average percentage, however, exceeded 50 percent. Visual detection was employed on both the "hasty" sweep (employing visual detection only, usually performed from a moving vehicle) and on deliberate sweeps.

2. According to these interviews, the major responsibility for visual detection fell on the "point" man. In the order of march of a deliberate sweep operation, the point man and his security element were the first men down the road. The point man was covered by a security element, enabling him to devote all of his attention to a visual search of the road. They were followed by individuals carrying electronic detectors. Most units used only a few specific individuals as point men. A few point men had attended one of the in-country mine and boobytrap schools but OJT accounted for most training. Except for two units, all felt that proficiency was increased if one man inspected the same road on a regular basis. He became familiar with the road and terrain and could detect changes (the dissenting opinion was that a man became overconfident working the same road daily).

3. Tho individual enemy sappers apparently varied considerably in skill in camouflage techniques, and some mines were much more easily detected than others. In some areas the enemy marked his mines, and the point man was especially alert for these markings. Point men also searched the shoulders, as often these were not adequately swept by other means.

4. Three of 34 units interviewed employed Kit Carson scouts (VC/NVA returnees employed as scouts) as point men. These units reported that the scouts were quite effective and had the advantage of being able to interrogate civilians.

5. Several sweep operations were observed, and the point men seemed confident and sure of their duties. They were especially thorough at culverts, inspecting inside as well as out. They were armed, but concerned themselves only with checking the road.

(b) Mine Detectors

1. Point men in a deliberate sweep were followed by personnel using electronic detectors, either the AN/PRS-7 or the AN/P-153.

2 AN/P-153 metallic mine detector

a. The AN/P-153, a hand-held metallic mine detector (see Figure II-40), was the standard mine detector employed in RVN during this evaluation. This mine detector functioned as an audio-frequency, mutual conductance bridge. The coils in the detector head, comprising the mutual inductance bridge, were electrically balanced. The transmitter coils sent out electromagnetic waves, setting up a magnetic field with a radius of from 3 to 4 feet around the detector. When a metallic object was encountered, the magnetic field became distorted, resulting in an imbalance in the mutual inductance bridge and causing a signal in the operator's headset. A phase-discriminating circuit built into the mine detector set cancelled out false signals caused by salt water or magnetic soil. Only signals caused by metallic objects were transmitted to the headset.

b. Detector operators from 14 engineer units were interviewed about the detector. All had used the AN/P-153. Most units stated that the number of detectors on hand was adequate, although three indicated that they could use more. Those desiring more detectors wanted them as maintenance floats. For instance, one company had only three of 17 operational. There were several common problems reported, as follows: The wiring jarred loose, causing short circuits in the area of the battery connections; breaks occurred at the elbow located near the search head; telescoping handles broke at the extension locations; the detector developed electrical shorts when wet; and commanders felt the detector was generally too fragile.

c. Operator training varied. Most operators had received advanced individual training (AIT) and many had been to one of the division-level schools. The skill of the operator was further developed through small-unit training and OJT. Only two operators indicated that audio signals produced by the set were too weak (the evaluators observed, however, that at least one-half of the detector operators hung the head set around their necks, as opposed to placing the earphones directly on their ears, apparently having no trouble hearing the signals).

d. Replies as to optimum sweep speed ranged from 1 mph to 3 mph, with some stating that it depended upon the terrain and road conditions. Operators stated they could comfortably operate the detector for 20 to 30 minutes at a time.

3. AN/PRS-7 Nonmetallic Mine Detector

a. The AN/PRS-7 is a hand-held nonmetallic mine detector (see Figure II-41). It was issued to field units in the latter part of 1970. A specialist from the Mobility Equipment and Development Center (MERDC) conducted in-country, new-equipment training for operators and supervisory Personnel. Attached as Annex F is a report of field testing done on the AN/PRS-7 during April of 1970. Nine of the interviewed engineer units had received the AN/PRS-7 detector.

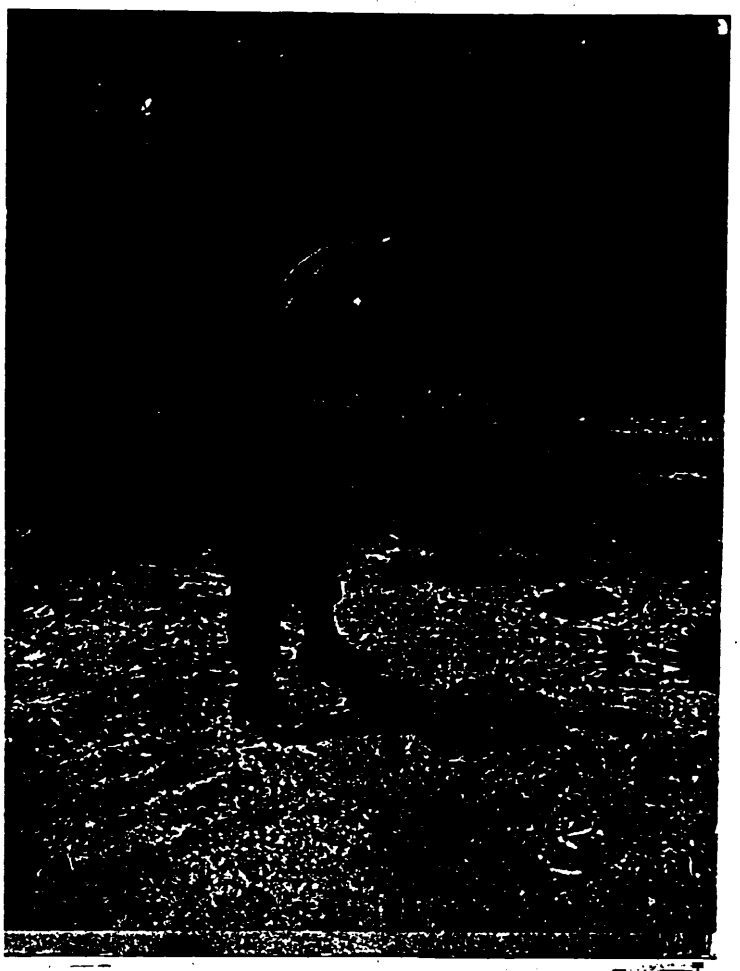
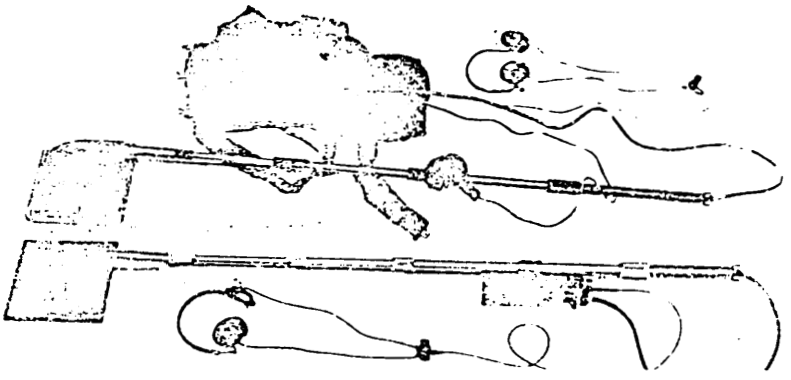


FIGURE **11-40** (U). **Mine** Petector; *AN*/P-153.

AN/PRS-4

WT. APPROX. 17=
BATT. LIFE - 8 TO 10 HRS.



WT. APPROX. 9=
BATT. LIFE. 25 HRS

1. TILT ANGLE OF SEARCH HEAD LESS CRITICAL
2. DESIGNED FOR EASE OF MAINTANCE
3. USES SOLID STATE COMPONENTS

AN/PRS-7

FIGURE II-41 (U). Mine Detectors AN/PRS-4 and AN/PRS-7.

b. The AN/PRS-7 operates on the principle that two antennas geometrically symmetrical and driven 180 degrees out of phase will produce a field null at a point equidistant from each antenna element in the absence of any unequal dielectric or conducting media in the field. When a dielectric or conducting medium is introduced to disturb or unbalance the field of one antenna, tht null level is changed in proportion to the amount of disturbance. A receiving dipole is located at the null point and detects any disturbance. The antenna system is slowly swept over the area to be searched. If a discontinuity in the conductance cf the ground is encountered, the antenna system is unbalanced because of the field disturbance and a larger signal is introduced into the receiving dipole. This signal is detected and processed to produce on audible indication of a discontinuity in an otherwise homogeneous medium. The system consists of a search-head assembly, a control box mounted on the handle, and earphones.

c. Operator training, which varied from one to four hours, was conducted by the MERDC representative. OJT classes were given from the operators manual, TM 5-6665-2930-13. Those who did not receive training conducted by the MERDC representative felt that they should have, and those who did indicated that there should have been more practical work associated with the class. Most advocated recurring training at the small-unit level.

d. Operators almost unanimously agreed that they received numerous false signals. Few could distinguish common debris and road abnormalities from an actual find (this was also the case with metal debris and a metallic mine detector). Two operators stated the audible signals produced were *too* weak.

e. Estimates of optimum sweep speed ranged from 1-3 mph depending upon terrain and condition of the road. Operators stated they could comfortably oaerate the detectors for 20 to 30 minutes at a tine. The detectors had developed very few malfunctions (one short circuit, one broken handle), although personnel in all units expressed having difficulty in obtaining batteries (the battery shortage was countrywide). The opinions concerning the AN/PRS-7 were varied. One operator didn't like the detector at first because of multiple readings, 5ut after finding a nitro-starch nine which otherwise night have been missed, his confidence in the detector increased. Several operators commented on the supersensitivity of the set,' stating that they had difficulty in using the set until they gained experience. One operator stated that the AN/PRS-7 was "the best detector in the Army system today."

4. The AN/PRS-4 nonmetallic mine detector (see also Figure 11-41) had been phased-out with the introduction of the AN/PRS-7. Personnel using it reported that the AN/PRS-4 was too heavy and "temperamental."

5. Another detector which had been used in-country was the mutual inductance, phase-selective bridge-type detector, truck-mounted. (For complete details, refer to TM 5-6665-203-12, April 1967). This detector, which can he operated manually or by remote control, *was* mounted in front of a 1/4-ton truck. The evaluator encountered only two engineer units which had had experience with this type of detector. Neither unit was favorably impressed with the detector, and the negative comments were profuse. The two major areas of deficiencies were mechanical malfunctions and absence of trained operators.

(c) Mine Dogs

There were approximately 27 nine-dog teams being employed in RVN during this evaluation. A team consists of a handler and a dog trained to respond to the class of stimuli which includes mines, boobytraps, and trip-wires. The 23rd Infantry Division had eight teams, the 25th Infantry Division had two teams, the 101st Airborne Division had five teams, the 1/5 Mechanized Brigade ha6 ten teams, and the 173d Airborne Brigade had two teams. Interviews with ten engineer units which had had experience in using mine dogs revealed that the majority felt that the dogs were useful and indicated that they would use them more often if they were available. Units reported that nine dogs were effective in locating trip-wires and mines. However, the dogs were not effective after rain, and they lost interest if they did not locate mines. Several of the units had only limited experience with mine does, so their observations might or might not have been valid. Evaluators contacted two units that maintained mine dog terns. These units reported the following information: most of these dogs were trained in CONUS, but some were cross-trained scout dogs, previously working in-country in that role. Sentry dogs were not cross-trained due to their aggressiveness. CONUS-trained dogs required acclimatization upon arriving in-country. The dogs were not trained on a wide enough variety of mines. Many were gun shy when they "reported for duty." The maintaining units reported that in the north the dogs suffered from ticks and hookworm In M 3, tropical canine pancytopenia (TCP), a blood disease, was the worst health problem. Mine dogs vere kenneled with scout dogs, where they received veterinary service. There were no major logistical problems concerning mine docs. Teams were picked up by units in wheeled vehicles or by helicopter. Each handler carried food for the dog with him. The team worked for a varying number of days, then returned to their compound for retraining. The demand for terns was greater than the number of terns available for missions. According to one unit, the enemy realized the value of the mine dog team and took measures to deal with it; i.e., dog handlers stated that a command-detonated claymore mine would sometimes he set 5 feet off a trail and detonated when the team entered the kill zone. An earlier, more complete, evaluation of mine dogs *can* he found in the ACTIV report on the 60th Infantry Platoon (Scout Dog) (Mine/Tunnel Detection Dog), Project No. ACG-65F, December 1969.

(d) Aerial Detection

No effective means of aerial detection were found during the course of thfs study.

(3) Detonation Method

(a) Kine Roller

1. The tank-mounted, mine-clearing, expendable roller (ENSURE 202) (see Figure II-42), was the only manufactured mine roller being used in RVN for deliberately detonating mines. According to the manual provided, it is an expendable, antitank mine-clearing roller designed to transmit a force to the ground approximately equal to the average force exerted by the M48A2 tank tracks. The ground force of the expendable roller is applied at a distance of approximately 9 1/2 feet ahead of the front road wheel of the tank. The roller is composed of two yoke and wheel assemblies, each wheel assembly composed of six individually articulating M48 road wheels. The six wheels each cover a width of 47 1/2 inches. The two wheel assemblies are attached to the main frame of the tank by means of an extension of the main frame. The extension is attached to the main frame by six bolts serving as breakaway points on detonation. (After detonations, the damaged section proved to be relatively easy to replace.) The main frame is attached to a tank-mounted structural frame by means of a pivot shaft. The structural frame is attached to the tank by the use of turnbuckle to the lifting eyes, turnbuckle to two nesting blocks welded to the tank hull, and pins through the two eyes on the tank hull. Force is transferred to each wheel by means of a rubber torsion spring assembly. One torsion spring assembly is affixed to the structural frame and one torsion spring assembly is mounted in the main frame. The amount of force is proportional to the weight transferred from the tank through the spring assembly by means of lengthening or shortening the chains on the spring assemblies. The weight of roller, including the tank mounting frame, is approximately 10,000 pounds.

2. Five engineer units that had used the mine roller were interviewed by the evaluators. The verious units had employed the rollers from three weeks to one year. In three of the units, M48A3 tanks were used as prime movers, and in the other two units combat engineer vehicles (CEV's) were used.

3. Minor problems were encountered when installing the system on an M48A3. Difficulty was encountered in aligning the attaching bolts and in replacing the turnbuckle under the tank after hitting a large mine. The CEV was modified to mount the roller. The bull blade was removed and special attachments were welded to the hull. No problems were encountered after modifications, Installation times averaged 4 to 8 hours with a four-man crew. The average time to replace a blown road-wheel set was about 30 minutes. A wrecker was required for replacing the expendable rollers on the tank-mounted roller. Only one engineer unit made deliberate sweeps with the mine roller. While employing the roller, mines were detonated by the prime mover on four different occasions. The reason for the mine detonation under the prime mover rather than by the mine roller could not

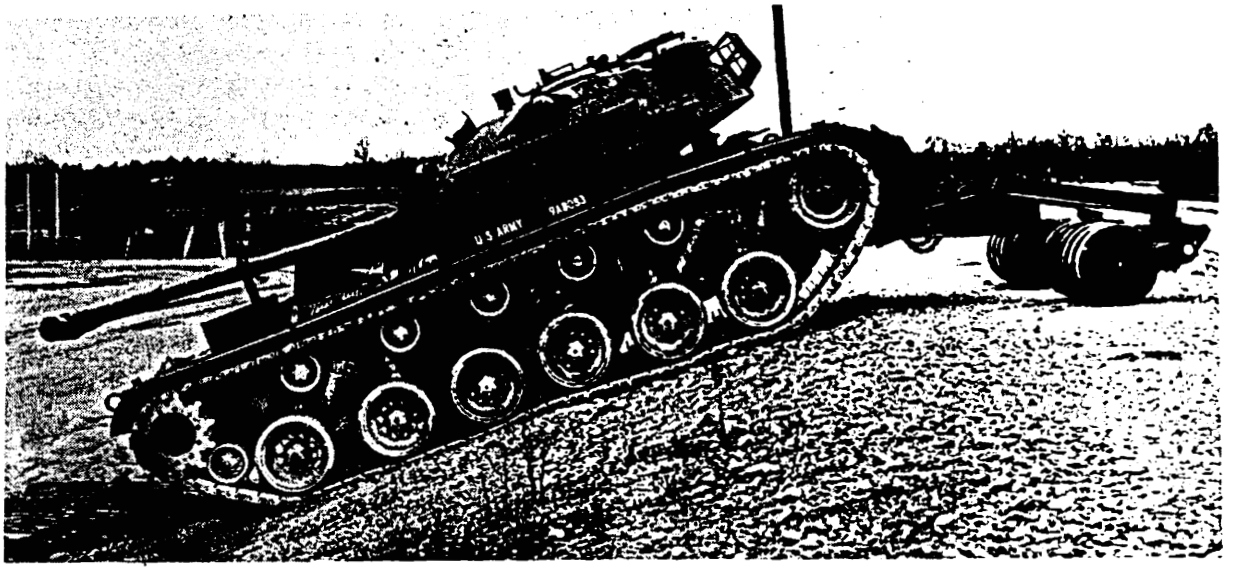


FIGURE II-42 (U). Mine Roller (ENSURE 202).

be determined; however, mines with offset fuzes have been found by two units, and one CEV prime mover was hit by a mine determined to have employed such a fuze. All units agreed that if the enemy correctly applied offset fuzes the effectiveness of the mine roller would be neutralized. The enemy would need only to enploy-mines as shown in Figure 11-43 to "hit" a prime mover coming from either direction on a road.

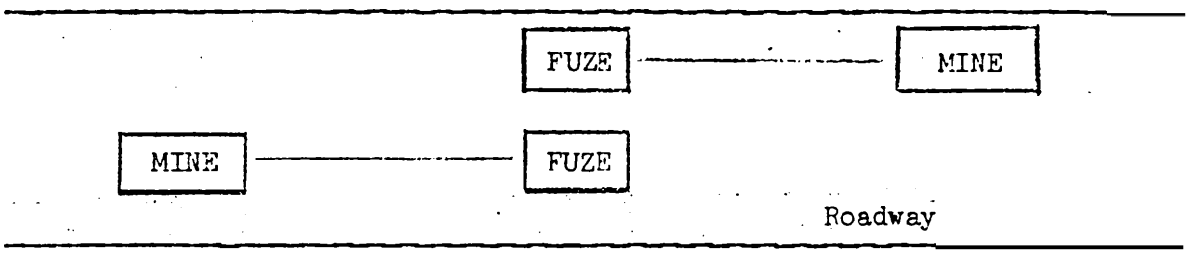


FIGURE 11-43 (U). Mines with Offset Firing Devices.

Maneuvering the roller on roads caused no major problems. One unit used it in a laterite pit, however, and found it awkward. Neutral steering is not possible and a larger-than-normal area is needed for turning. The nine roller is slightly wider than the prime mover; therefore, it can not go through as narrow an opening. The mine roller was usually employed in a two-pass method: i.e., from starting point to completion point on one side, and return on the other side. One unit hung heaw rubber strips, weighted on the bottom, on a line between the extension arms. These weights swept in the *area* between the two sets of rollers and detonated at least one nine that had a tilt-type fuze. One unit did not feel the coverage on a two-pass method was adequate. They made six to eight passes on their roadway. These rollers were employed on laterite and laterite-rock improved roads. The efficiency *is* reduced when working in heavy mud and over irregular terrain. The rollers were employed at speeds from 5 to 15 mph and all queried units stated that the speeds met their tactical needs. Some drawbacks were reported by using units, as follows: Poor driver visibility with respect to the rollers (i.e., when rocks jammed between the wheels the driver was unaware of it; because of this jamming the wheels were unable *to* articulate); and the grease nipples on the yoke and wheel assembly faced forward and had a tendency to tear off if the system were operated in underbrush.

4. The engineer units which had the mine roller did not have organic M48 tanks, and CEV's were not authorized to TOE units of the size that were using the nine roller. Therefore, problems existed in maintenance, in obtaining repair parts, in recovery operations, and in lack of trained personnel for both maintenance and operation of the mine roller.

(b) Proof Vehicles

A "proof!' vehicle wits one used to detonate any mines not detected by the dismounted sweep team on a deliberate sweep, or was used alone, instead of a sweep, if one could not be conducted practically. Because of its intended purpose, the proof vehicle was likely to sustain extensive damage and, in many cases, could not have been repaired economically. Interviews with engineers revealed that proof vehicles were employed in the following two major roles: they were the first vehicles, behind the dismounted sweep team, in a deliberate sweep; or they themselves constituted a hasty sweep. A hasty sweep was employed when a low level of enemy activity and/or the time element and length of sweep involved that a hasty sweep was most practical. Two units employed tanks in the proofing role; however, a 5-ton dump truck, loaded with fill, was more commonly used as a proofing vehicle. Damage to the vehicles and personnel injuries varied with the size of mine detonated. The commander of one unit stated they did not employ a proof vehicle, because they could not afford to lose a dump truck. One method of using a 5-ton dump truck was to back the truck down the road, filled with rock and withe the "headache board" (a metal shield over the cab) removed. Removing the headache board reduced the probability of driver injury. The fill could he used to repair road damage resulting from detonation. When tracked vehicles were used, they were generally run as the first vehicles of the security element. All personnel interviewed indicated that a proof vehicle of some type should always be employed.

(4) Employment of Mine Sweeps

Engineer units were interviewed concerning their road ween operations. The sweep distances involved ranged from two or three kilometers to about 20 miles. The roads included major LOC's as well as routes to FSB's. Personnel of only one unit stated that the time allocated to complete the sweep was not always adequate. In most instances, the engineers were working for themselves; i.e., they swept to their worksite and could not start the productive work day until they arrived at the location. In addition, six of the units occasionally received unscheduled commitments to clear roads. Composition of the sweep varied somewhat depending on available resources and unit preferences. Off-road, flank security was employed when troop resources permitted. Infantry, ARVN, or Regional Forces/Popular Forces (RF/PF) were usually assigned the flank security mission. They watched for evidence of enemy activity, including possible ambushes and sites for command-detonated mines. Individual security personnel, usually engineers, were spaced throughout the walking column. When possible, there was at least one security vehicle. Tracked vehicles were preferred, but if these were not available pin-trucks or gun-jeens were used. Engineer units were often responsible for providing all of their own security. If available, a mine-dog team preceded the on-road column, covered by one or more security men. When *a* suspected mine was located by either the dog team or a point man, a detector operator was brought forward to pinpoint the location of the mine. At the same time the immediate area was searched for trip-wires. If wires

were found they were cut immediately, one at a time. A prober was brought up to uncover the suspect object for identification. He exposed enough material to determine whether or not the object was a mine; if it was a mine, he notified the OIC or NCOTC. In all stages of identification only necessary personnel were within 50 meters of the sweep team. The OIC/NCOIC decided whether to destroy the mine in place, notify EOD for removal, or remove it with a grappling hook and rope. The situation dictated the action, but most units had SOP's governing these operations. Four of the interviewed units always blew the nine in place; two always grappled the nine: and others made decisions depending on the situp-tion. If the nine was blown in place, this was done by demolitions specialist. All units interviewed used C-4 explosive and a time fuze. The OIC/NCOIC followed the point team, preceding the detector team. He could better control the sweep from this location because of *the* proximity of the different elenents of the sweep team. Detector operators were rotated roughly every half hour to preclude tiring and because operators gradually lost the ability for tone differentiation if listening throurh the headset for too long. Shoulders as well as roadways were swept. A medic usually accompanied the sweep team, either walking with the OIC/NCOIC or riding at the rear of the team. He was available to render first-aid and to assist in "dust off" operations to evacuate injured personnel.

e. FINDINGS - OBJECTIVE 6

(1) During the period June 1970 through March 1971 there were 213 mining incidents involving vehicles which resulted in 175 vehicles being lost and 803 casualities; 66 percent of the vehicles and 32 percent of the casualities were US [6a; p. 11-59].

(2) From 1 January 1967 through 31 December 1970 there were 2,691 mining incidents involving vehicles [6b(1); p. II-59].

(3) Monthly equipment losses to mines peaked in mid-1970 [6a(3); p. II-64].

(4) On eleven key items of equipment, losses due to mines represented 68 percent of all combat losses from 1 January 1967 thru 31 December 1970 [6b(3); p. 11-64].

(5) During the years 1967 through 1970 percentages for the killed and wounded as a result of mines or boobytraps rose from 7.2 percent to 25.6 percent for KIA, and from 11.2 percent to 25.4 percent for WIA [6a(4); p. II-64].

(6) The enemy employed manufactured metallic, manufactured nonmetallic, inprovised metallic, and inprovised nonmetallic mines [6c(1)(a); p. II-76].

(7) The enemy employed a wide variety of road-mining tactics on the traveled way, on shoulders, in the ditch line, in potholes, and in culverts [6c(2)(a); p. 11-76].

(8) Tactics and techniques varied from area to area but were fairly uniform within a given area [6c(2)(a); p. 11-76].

(9) Mines, either pressure- or command-detonated, were sometimes used to initiate an ambush, agzinst both sweep teams and convoys [6c(3); p. II-79].

(10) The limited data available indicated that paving reduced mining incidents [6c(4)(c); p. II-79].

(11) Surveillance was often employed after a deliberate nine sweep to prevent subsequent mining of the swept road [6d(1)(a); p. 11-80].

(12) The type and extent of surveillance varied with the extent of enemy threat, traffic subsequent to the sweep; the availability of ARVN support and security vehicles, the length of road involved, and the terrain [6d(1)(a); p. II-80].

(13) Land clearing was not conducted along all roads [6d(1)(b)3; p. II-81].

(14) Preventing regrowth after land clearing was a problem [6d(1)(b)3; p. II-81].

(15) The Volunteer Informant Program (VIP) was a countrywide MACV program to encourage civilians to volunteer useful information on enemy activities for monetary rewards; [6d(1)(d)1; p. 11-82].

(16) There was a direct relationship between the number of VIP PSYOP missions conducted and the recognizable results [6d(1)(d)2; p. II-82].

(17) Visual detection of nines ranged from a low percentage in some areas to 100 percent of the total detections in other areas; the average percentage of visual detections exceeded 50 percent of the total detections [6d(2)(a); p. II-83].

(18) The major responsibility for visual detection fell on the sweep team's point man; his proficiency generally increased if he inspected the same road on a regular basis [6d(2)(a); p. 11-83].

(19) Detector operators could operate the detectors comfortably and effectively for only 20 to 30 ninutes at a time [6d(2)(b); p. II-83].

(20) The AN/P-153 and/or the AN/PRS-7 hand-held mine detectors were used to back-up the point man on the sweep team [6d(2)(b)1; p. II-83].

(21) Mine dogs were effective in locating trip-wires and nines [6d(2)(c); p. II-88].

(22) The ENSURE 202 mine roller was the only manufactured mine roller being used in RVN for the purpose of deliberate mine detonation [6d(3)(a); p. II-89].

(23) Units stated that enemy application of correctly spaced offset fuzes could neutralize the effectiveness of mine roller [6d(3)(a); p. II-89].

(24) Proof vehicles were employed to detonate any emplaced mines undetected by the preceding dismounted sweep team in a deliberate sweep, or were used alone to constitute a hasty sweep [6d(3)(b); p. II-92].

(25) When a suspected mine was located by either the mine-dog team or a point man, a detector operator was brought forward to pinpoint the location of the mine; at the same time the immediate area was searched for trip-wires [6d(4); p. II-92].

(26) In all stages of mine clearing operations, only necessary personnel were within 50 meters of the suspected mine [6d(4); p. II-92].

7. (C) OBJECTIVE 7 - RELEVANT DOCTRINE COMPARED WITH PRACTICES OBSERVED DURING EVALUATION

Doctrine contained in references g through y (see paragraph I-1) was reviewed to determine those portions relevant to the scope of this study. In general, this included all doctrine pertaining to convoy operations under general conditions as well as that specific to stability operations, and all which pertained to road mining. Practices observed during the evaluation were then compared with this doctrine. The resulting material has been organized into three columns - "Doctrine," "Practices," and "Findings." The information presented in the first column represents doctrine relevant to the scope of the study, as discussed above. The material under "Practices" describes briefly the practices found to be prevalent in RVN relating to each particular section of doctrine. "Findings" states whether or not these practices indicated that doctrine was being followed. Doctrine quoted (and practices relating to it) has been organized under the following headings: "Convoy Organization," "Flexibility in Convoy Operations," "Maintenance," "Highway Classification," "Convoy Security," and "Road Mining."

DOCTRINE	PRACTICE	FINDINGS
1. CONVOY ORGANIZATION		
a. All personnel in the convoy will be thoroughly briefed prior to movement. This briefing will include: (a) details of route, speed, check points, order of march and maintenance of intervals and contact between vehicles; (b) personnel loading of vehicles; (c) distribution of weapons; (d) appointment and duties of vehicle commanders and vehicle guards; (e) immediate action to be taken in the event of guerrilla ambush; and (f) counterattack plans. (FM 31-22, App IV, Para 6, US Army Counterinsurgency Forces 9 November 1963).	Convoy commanders conducted appropriate briefings, except in MR 1 during Operation LAMSON 719, where no briefing of convoy personnel was observed (Objective 4).	Generally, convoy commanders briefed their personnel in accordance with doctrine, except as noted in MR 1 during LAMSON 719.
b. Every unit should have complete and comprehensive orders or plans covering movement by roads. These should cover in detail the appointment and duties of convoy and vehicle commanders. A commander must be detailed for each convoy. The convoy commander will position himself where, according to the circumstances, he can best accomplish his mission. This will not necessarily be in the first or last vehicle. An armored vehicle or an armed soft vehicle, such as the 1/4-ton truck with LMC mounted, should be used as the commander's vehicle. Radio communications must be provided for movement control of convoy's and notification to alert forces of an ambush. In addition, provisions must be made for passage of command in the event the commander hccomes a casualty. (FM 31-22,	Units had adequate SOP's covering convoy operations. The convoy commander's position in the convoy was flexible; however, he generally positioned himself near the rear of the convoy, because from this position he tended to approach trouble spots instead of moving away from them. Command vehicles included 1/4-, 3/4- and 5-ton gun trucks. The 3/4-ton and 5-ton trucks were most grequently used as command vehicles because they were more easily armor-plated. The AN/GRC-106 was used for improved communications when the equipment was available (Objective 4).	Doctrine was being followed.

DOCTRINE	PRACTICE	FINDINGS
AppIV, para 4, US *Army* Counterinsurgency Forces, November 1963).		
c. It is desirable to mark or otherwise designate vehicles of the column for control purposes. Such identification is subject to local conditions and is usually specified in standing operating procedures. Marking should be kept to a minimum consistent with its need in column control. Temporary markings should be easily removable.	On many convoys, panel markings for identification of convoy vehicles by aircraft were missing, making it difficult for support aircraft crews to identify the convoy (Objective 4)	Doctrine was not being followed.
(1) Command and control vehicles of each element of a column are indicated by flags approximately 12 to 18 inches (30 by 45.7 centimeters) in size. The leading vehicle carries a blue flag; the rear vehicle, a green flag; and the vehicle of the commander, a white-and-black flag (STANAG 2154, App H). Flags are mounted on the left side of the vehicle except where vehicles are driven on the left side of the road, in which case flags are mounted on the right side.	STANAG cloth control indicators were not used. (Objective 4)	Doctrine was not being followed. (There was no apparent need for the indicators since the vehicles were easily identified by their type and load).
(2) The number assigned to a movement serial (STANAG 2154, App H) is marked on the front and on both sides of each vehicle in the serial. The markings must be clearly visible from the ground and must not conceal other prescribed markings. When aircraft are used for column control, approximately every fourth vehicle in the column should have the movement number marked on the hood for visibility from the air. (FM 55-30,	Generally, convoy movement numbers were not displayed, for either ground or air visibility. Some aviation units reported the absence of any convoy markings which could be used for air identification. (Objective 4)	Doctrine was not followed.

DOCTRINE	PRACTICE	FINDINGS
para 3-4, Army Motor Vehicle Transport Operations, June 1969).		
d. The column commander (OIC/NCOIC) is responsible for its actions during a movement. He issues orders to initiate the march and insures that instructions contained in standing operating procedures and march orders are complied with, covering the preparation for and conduct of the march. He must be free to supervise the movement of the column, and selects his position in the column on the basis of anticipated problems.	Convoy commanders complied with existing unit SOP's in conducting convoys, which were generally well managed. Convoy commanders had complete freedom of movement and positions within the convoy. (Objective 4)	Doctrine was being followed.
e. Column control is maintained by command and staff personnel at all echelons within the column. Commanders of serials and march units are responsible for operating their elements of the column, each using his staff representatives to assist as he may direct (TM 55-310). (FM 55-30, para 3-3, Army Motor Transport Operations, June 1969).	Control officers and NCO's functioned as directed by the convoy commander, while maintaining control of their serials or march units. (Objective 4)	Doctrine was being followed.
f. Adequate communications within a column is essential to effective command and control.. Unit SOP may designate the various means of communication and their use under specific circumstances. (FM 55-30, para 3-5, Army Motor Transportation Operations, June 1969).	Column communication was accomplished with AN/VRC-46 and AN/VRC-47 radios and was deemed adequate within the column. Communications outside of the column was accomplished with the AN/GRC-106 single sideband radio, when available. The AN/VRC-46 and AN/VRC-47 radios were not adequate in range for contact with supporting forces. (Objective 3)	Doctrine was being followed.

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DOCTRINE	PRACTICE	FINDINGS
2. FLEXIBILITY IN CONVOY OPERATIONS.		
a. The equipment available, the road conditions, and the logistical mission or military situation governing line hauls may vary in each situation. Since line-haul operations may be adapted in many ways to suit particular situations, successful operations depend in a large measure on the ingenuity and initiative of individual commanders and on the ability of planning staffs to foresee needs and to provide the types of equipment required. The semitrailer relay method is normally used in line-haul operations. (FM 55-30, para 7-7 Army Motor Transport Operations, June 1969).	A new system was initiated 1 January 1971 in Cam Ranh Bay Support Command which eliminated MCC and combined its responsibilities with TMA MACV to provide a central clearing house for all modes of transportation and to streamline movement of all cargo through common-user transportation assets. (Objective 3)	Doctrine was being followed.
b. Military motor movements are affected by a wide variety of conditions over which planning and operating personnel have no direct control. These conditions can be anticipated to varying degrees, and provisions can be made for operations with these factors taken into consideration. All plans and operations must be sufficiently flexible to meet unpredicted weather, terrain, tactical conditions, civilian controls and availability of road network. (FM 55-30, para 1-3, Army Motor Transport Operations, June 1969).	Most of the intelligence received at the unit level mot the requirements of the units. Many units operated convoys in relatively secure areas and did not require intelligence to any extent. In some cases intelligence was not fully employed for convoy operations; for example, convoy commanders and company commanders involved in convoy operations in MR 1 stated that, regardless of the intelligence received, the convoy rolled on schedule. (Objective 3)	Units did not employ intelligence as envisioned in doctrine.
c. The MCC develops the movement plan, which outlines tonnage, class, and areas of origin and destination of	These functions are accomplished by the MCC, and under the new system, by TMA MACV. (Objective 3)	Doctrine was being followed.

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DOCTRINE	PRACTICE	FINDINGS
cargo to be moved by motor transport. (FM 55-30, para 2-3c, Motor Transport Operations, June 1969).		
d. Priorities are issued on the basis of urgency or critical need. Priorities are established on the basis of the commander's requirements to meet the military situation and can be expected to change from time to time. (FM 55-10, para 6-9c, Army Transportation Movement Management, June 1969).	Priorities *are* issued based on the MACV Integrated Priority System, which contains 43 priorities based on urgency or critical need as established by *the* commander planning the requirement. (Objective 3)	Doctrine was being followed.
3. MAINTENANCE		
a. Maintenance and repair services for vehicles used in relay operations are the same as for all military vehicles. However, modifications in usual procedure may be required. Normally, military vehicles may operate 4 to 6 hours a day, but in relay operations equipment may operate 20 hours a day, thereby increasing maintenance requirements. In addition to the normal mechanic augmentation provided to truck units in round-the-clock operations, is is often necessary to assign nondriver personnel as mechanic's helpers.	The increased equipment utilization was not supported with an increased maintenance capability. Transportation unit personnel were heavily committed to convoy operations, leaving only minimum personnel to accomplish the required maintennnce. (Objective 3)	Doctrine was not followed.
b. Consolidated maintenance permits maximum use of maintenance skills and facilities. To provide a service section at a truck terminal, the battalion	The only consolidated maintenance found was a consolidated trailer transfer point (TTP) which operated for an extended period of time without adequate personnel, tools,	Doctrine was not followed.

DOCTRINE	PRACTICE	FINDINGS
headquarters draws from its assigned companies the required mechanic personnel, tools, and equipment. Consolidated maintenance may be provided in three ways, depending on conditions:	or management. (Objective 3)	
(1) Grouping of all maintenance personnel into one centralized area of pool.		
(2) Drawing only the mechanics required to do these consolidated maintenance tasks under battalion supervision.		
(3) Detailing company mechanics to the battalion maintenance service and rotating them on a day-to-day shift basis. (FM 55-30, para 7-14, Army Motor Transport Operations, June 1969).		
c. If disabled vehicles are abandoned, destruct procedures (STANAG 2113), as established in local SOP's or directives, will be implemented to deny use of the abandoned equipment to hostile forces. (FM 55-30, para 4-8e, Army Motor Transport Operations, June 1969).	Disabled vehicles were repaired, recovered, or destroyed, in that order of preference. As a last resort, vehicles were sometimes temporarily abandoned with the intent to recover, which did occur during operation LAMSON 719. Most of these vehicles were recovered. (Objective 3)	Doctrine was being followed.
4. HIGHWAY CLASSIFICATION		
a. Highway routes are classified according to the degree of control demanded. The following classifications of highway routes has been made for military operations: open route, supervised route	Classification of roads by degree of control demanded was not found to be in use in RVN, nor were such classifications considered useful or necessary. (Objective 3)	Classification of routes by degree of control demanded were not applicable to RVN.

COCTRINE	PRACTICE	FINDINGS
dispatch' route, reserved route, and prohibited route, (FM 55-30, para 7-14, Army Motor Transport Operations, June 1969).		
b. Classification of Surface LOC, military police security operations for surface LOC, land or water, should be determined by the enemy threat. The condition of a linear route may be described in the familiar traffic-light descriptive terms as green, yellow, or red. (FM 19-50, para 6-31, Military Police in Stability Operations, February 1970).	Route security classification is determined by the level of enemy threat according to codes established by FM 19-50. (Objective 3)	Doctrine was being followed.
5. CONVOY SECURITY		
a. Maximum precautions should he taken *to* prevent guerrillas from gaining information concerning vehicle movements. Points *to* consider are: telephone systems ma.; not be secure; radio messages may be intercepted; loyalty of civilians cannot be guaranteed, fixed regularity or pattern in the movement of convoys invite ambush; convoy information should be disseminated on a "need to know" basis and as close to departure time *as* possible; plans should be formulated for alternate routes and deceptive measures; convoys should he assembled at the latest possible time before	All convoy radio transmissions monitored by ACTIV evaluators were voice transmissions made in the clear and generally used code words for locations. In a few instances, locations were discussed in the clear, and excessive nonessential radio transmissions were made. (Objective 3). Convoy schedules were limited in flexibility. Rarely were alternate routes available, Fnd requirements dictated a given number of convoys per week to a given location. Convoys were rotated with regard to the particular day of the week, but this did not alter the number of convoys ncr week and the rotation of days was generally held within	Security of convoy information was not within the scope of this evaluation,

DOCTRINE	PRACTICE	FINDINGS
departure. (FM 31-23, para 7, US Army Counterinsurgency Forces, November 1963).	one day of the scheduled requirement. Convoy schedules were further restricted by the customers' ability to receive and stow supplies. (Objective 3)	
b. The basic immediate action procedure, therefore, is to endeavor to continue moving when fired upon, to halt only when the killing zone is either cleared or before entering it, and to counterattack immediately. (FM 31-22, para 4e(1), Counterinsurgency Forces, November 1963).	Conflict of instructions was found in only one instance, in which, while the ambushed convoy was increasing speed to clear an ambush kill zone, the infantry passengers were jumping over the side to engage the ambush force. (Objective 4)	Doctrine was generally followed; in one instance, however, the pre-briefing for the convoy failed to cover adequately the transportation of tactical troops.
c. Close-air and aerial. fire support planning provides for armed helicopters and fixed-wing strike aircraft. Since the presence of aircraft has a proven deterrent effect on ambushes, column cover is habitually requested. Planning includes the type, number and method of employment of aircraft. Methods of employment include column cover, air alert, and ground alert, Since column cover by fighter aircraft is expensive in terms of crew fatigue and equipment maintenance, light observation type aircraft are used and generally are sufficient for short movements over frequently used routes in more secure areas (FM 31-16, para 17c, Counterguerrilla Operations, March 1967). Armed helicopters provide ground commanders with a highly mobile and immediately responsive aerial fire support	Aircraft cover of convoys was a deterrant to ambushes. O-1 aircraft were considered adequate support when they had a supporting reaction force on call. This aircraft was generally preferred for convoy air cover; the extended flight time required for this mission was usually not available from helicopter units. Armed helicopter support was generally on a "strip alert" basis or as an on-call. reaction strike force. When called upon, armed helicopters were usually at the scene of an ambush well within 10 minutes.	Doctrine was being followed.

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DOCTRINE	PRACTICE	FINDINGS
6. ROAD MINING		
a. The most effective means of reducing insurgent mining is to deny the insurgent the opportunity or means to emplace mines. Mine detection, protective measures as well as denial of materials should be stressed (FM 20-32, para 6-9, 6-10, Landmine Warfare, January 1971).	Land clearing and road paving were used to reduce enemy mining on LOC's. The Volunteer Informant Program was employed to decrease enemy capability to employ mines and demolitions against friendly personnel and vehicles by encouraging and rewarding the reporting and/or turn-in of explosive materials. (Objective 6)	Doctrine was being followed.
b. A comprehensive system of mine incident reporting should be established. Intelligence analysis of reports will reveal areas of heavy mining activity as well as types of mines and firing devices, Increased surveillance and cordon and search operations in such areas should prove effective in reducing incidents (FM 20-32, para 6-13, Landmine Warfare, January 1971).	A comprehensive system of mine and booby-trap reporting was established by using a statistical work sheet (MACV Form 54) (ANNEX J). The data was compiled for field use and made available to field commanders. MACV Combined Materiel Exploitation Center (CMEC) end the US Army Engineer Command, Vietnam, Mine Warfare Center provided additional support to the countermine program. Some data used for the project lacked depth due to the lack of information from which to determine on-road versus off-road incidents over recent years. The CMEC reporting system was fairly comprehensive but lacked the scientific data required to identify convoy mining incidents. The USARV Transportation section of ODCSLOG did report incidents directed against vehicles but did not address convoys. (Objective 6)	Doctrine was followed on gathering information. The use of this data for surveillance, cordon and search operations were not within the scope of this study. Both systems lacked positive control on submission of accurate incident reports as required by joint regulations. The ARVN seldom reported on MACV Form 54.
c. Detection and countermeasures to prevent route mining may require cooperation with the local population. Liaison with local civil affairs elements may	The Volunteer Informant Program was effective in working with the local population which reported on enemy activities. (Objective 6)	Doctrine was being followed.

DOCTRINE	PRACTICE	FINDINGS
disclose information relating to insurgent mining. (FM 20-32, para 6-6, Landmine Warfare, January 1971).		
d. Institute a program of payment, to informants for information concerning insurgent mine locations and caches of mines and mine manufacturing materials. Include in the program payment for turn-in of mines and materials which could be used to manufacture mines. Provide, when necessary, protection of the informant from insurgent reprisal. Use former insurgents who have defected to accompany patrols and mine sweep teams. Their knowledge of insurgent mining techniques may prove invaluable. (FM 20-32, para 6-14, Landmine Warfare, January 1971).	These programs were in effect; however, some problems existed in obtaining adequate funds to support the program and in making timely payment, particularly on the part of nondivisional units. Kit Carson scouts were used widely on patrols and mine sweep teams. (Objective 6)	Doctrine was being followed. However, more emphasis is needed on making prompt payment.
e. Visual search is an important method of locating mines. Experience with the mine habits of an enemy is often of great help in locating his mines. (FM 5-34, para 3-10, Engineer Field Data, December 1969).	The greatest percentage of mines detections were made visually by a trained observer. (Objective 6)	Doctrine was being followed.
f. The soldier operating a metallic or nonmetallic mine detector has an exacting job and he must constantly watch for boobytraps and trip-wires. Twenty minutes at a time should be the maximum period for each soldier. (FM 20-32, para 5-7, Landmine Warfare, January 1971).	With few exceptions, detector operators were well trained for their mission and performed their mission well. Operators were rotated generally every 30 minutes. (Objective 6)	Doctrine was being followed.

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DOCTRINE	PRACTICE	FINDINGS
g. Careful probing or search around the charge is necessary to locate and neutralize all anti-lift devices. Recognition of the type of firing mechanisms used is necessary to avoid casualty. All safety devices must be replaced. If complete neutralization seems doubtful, the charge should be pulled from place by a grapnel or rope from a safe location. After the charge is pulled, the operator should wait at least 30 seconds to safeguard a concealed delay action fuze. (FM 20-32, para 5-8, Landmine Warfare, January 1971).	Adequate safety precautions and safety techniques were employed while probing, uncovering and removing or destroying the mines. (Objective 6)	Doctrine was being followed.
h. Safety precautions are observed during mine breaching and clearing operations. Personnel in a minefield will remain dispersed. (FM 20-32, para 5-12, Landmine Warfare, August 1966).	Personnel remained well dispersed during mine breaching and clearing operations. (Objective 6)	Doctrine was being followed.
i. Steps can be taken to make it difficult for the insurgent to lay mines. Methods such as the following should be taken: institute ambushes; saturation patrolling to include use of dogs; deny access to major routes by increased use of harassing and interdictory fires; use observation towers along major routes; employ sensors; aerial surveillance and airborne searchlights (FM 20-32, para 6-11, Landmine Warfare, January 1971).	None of these methods indicated were observed during the course of this evaluation.	Doctrine was not being followed.

ANNEX A

GLOSSARY

Ambush	Surprise attack **from** a concealed position upon either moving or a temporarily halted target.
AO	**Area** of Operation.
ARVN	Army of the Republic of Vietnam.
Attack **by Fire**	**An** attack employing organic weapons and may include supporting fires. The attack normally does not employ an assault, but includes sniper fire **as well** as **massive** deliberate **ambushes.**
Backload	Cargo that is returned **from** original destination of convoy, retrograde *cargo.*
B 40	NVA/VC Antitank grenade launcher which fires the **PEG-2** round.
Bobtail	Truck tractor without a trailer.
Chicom	Chinese Communist **(as** an adjective).
CICV	Combined Intelligence Center, Vietnam, MACV-J2.
CMEC	Combined Materiel Exploitation Center, MACV-J2.
Convoy	**A** group of transport vehicles organized for the purposes of control and orderly movement, with or without escort protection.
Countermine Procedures	***Any*** procedure used to prevent **or** detect **enemy** mining.
Deliberate Mine **Sweep**	A mine **sweep** which usually **employs** several means of detection and **is** accomplished by dismounted personnel.
DCSLOG	Deputy **Chief** of Staff, **Logistics.**

Duster	**A self-propelled,** twin 40mm antiaircraft weapon for use against **low** flying aircraft, also **used** as direct **fire anti-**personnel weapon.
Dust-Off	Medical **Evacuation** Helicopter.
FAC	**Forward Air Controller.**
FWMAF	Free World Military Assistance Forces.
Gunship	Helicopter, equipped with a **weapon** system, end having a primary attack mission.
Gun-truck	Hardened vehicles **with various weapons systems** added as active protection.
Hardened Truck	Addition of armor plate, sandbags **or** other protective materials to a standard vehicle to provide **passive** protection.
Hasty Mine **Sweep**	**A mine** sweep which employs **visual** detection only **and** is usually accomplished fron a moving vehicle.
Hoi Chanh	NVA/VC who rallies to the side of the government of Vietnam under the Chieu Hoi Program.
Lines of Communication (LOC)	**All** the routes - land, ***sea,*** and air which connect an **operating** military force with **a base** of operations and **along** which **sup-**plies and military forces move.
LTL	Vietnam interprovincial highway.
LZ	Landing zone.
'Kit **Carson** Scout (KCS)	VC/NVA returnee (rallier) **employed as a scout for a** U. S. unit
MCC	Movement Control **Center,**
Military Standard Requisition and Issue Procedures (MILSTRIP)	A uniform procedure established by DOD for use within DOD to **govern** requisition and issue of material within standardized priorities.
Military Standard Transportation and Movement Procedures (MILSTAMP)	Uniform and standard transportation **data,** documentation and control **procedure** applicable to **all** cargo movements in the **defense** transportation **system.**

Mine Sweep	Coordinated search of an area to detect mines.
M79	Single-shot, breach-loeded, shoulder-fired 40mm individual grenade launcher.
Offset Fuze	Detonatiqn device set at a distance from the explosive.
OJT	On-the-job training.
Peneprime	Liquid asphalt.
POL	Petroleum, oil and lubricants.
Proof Vehicle	A vehicle used to detonate mines by rolling over them, often follows other mine detection systems.
QL	Vietnam national highway.
Road Clearing	The clearing of any obstacle from the road.
Road Sweep	Mine sweep conducted over a road.
RP	Release point.
RPG	Rocket-propelled grenade.
Shotgunner	Term referring to an armed guard who accompanies a vehicle.
SOP	Standing Operating Procedures,
SP	Start point.
Staging Area	Area where convoy vehicles and personnel are assembled prior to the start of the move.
Support Command	Any one of the three USARV commands which has as its mission the command and control of assigned and attached combat service support units which furnish direct support to nondivisional units and back-up support to divisional support commands for all U.S. and FWMAF operating In RVN. The three support commands are major subordinate or USARV and report directly to CG, USARV.

TAOR	Tactical Area of Responsibility.
TMA	Traffic Management Agency.
USARV	US Army, Vietnam.

ANNEX B

TYPICAL CONVOY AMBUSH

1. (U) PURPOSE: To outline the events and actions taken by the 27th Transportation Battalion when ambushed on highway QL-19 in the Mang Giang Pass at approximately 1100 hours on 21 November 1970. This is a fairly representative description of a VC/NVA deliberate ambush.

2. (C) BACKGROUND

a. The 27th Transportation Battalion convoy had departed the TTP, Cha Rang, approximately 0830 hours on 21 November 1970, with some vehicles destined for An Khe and the remainder for Pleiku. On passing through An Khe, approximately 1030 hours, the vehicles destined for An Khe turned off the highway for Camp Radcliff. An additional four tractors with tanks joined the remaining 25-vehicle convoy and proceeded toward Pleiku. This convoy was commanded by an NCO of the 359th Transportation Company. A newly assigned platoon leader was riding with the convoy commander as an observer in preparation for being a future convoy commander. The lead vehicle was a jeep equipped with radio. The gun-truck "Brutus," 359th Transportation Company, was the sixteenth vehicle in the convoy. The maintenance truck, "Ball of Confusion," and a jeep containing the convoy commander were at the rear of the convoy. Tractors in the convoy were from the 359th Transportation Company, 2nd Transportation Company, 597th Transportation Company (all of Phu Tai), and the 88th Transportation Company from An Khe. Just 10 minutes prior to the ambush, an eastbound 27th Transportation Battalion convoy had cleared the contact area.

b. The area is sloping, with tall grass and scattered thickets growing to the roadway on both sides. On the south side of the roadway, the terrain slopes upward. On the north side of the highway the terrain slopes downward to a draw, then climbs on the other side of the valley. A tree line is about 250 meters from either side of the road. A small knoll within 75 feet of the south side of the roadway was the eastern limit of the kill zone.

3. (C) AMBUSH

a. The convoy was proceeding west up the Mang Giang Pass (vic BR 236503) at 1105 hours when the middle of the convoy came under small-arms and automatic weapons fire and B40 rocket fire from the left side of the road. The gun-truck "Brutus" immediately announced "contact" over the radio and began suppressive fire with a .50-caliber machinegun and a mini-gun. Six tankers and "Brutus" were in the kill zone, which extended approximately 800 meters.

b. Sustained small-arms and automatic weapons fire, primarily from the left side of the road, continued for approximately 20 minutes. Sporadic firing continued another 15 minutes. Occasional small arms fire was observed from the tree line on the north side of the road. The gun-truck "Brutus" engaged, with the mini-gun, what appeared to be a prepared automatic weapons position about 75 meters to the left of the road. The automatic weapon was silenced.

c. Two 5,000-gallon tankers caught fire and were abandoned. One had continued up the road approximately 300 meters before stopping at the side of the road. One tanker jackknifed, partially blocking the road. Three other tankers received numerous bullet holes causing fuel leakage and flat tires. The remaining vehicles initially within the kill zone continued to the top of the pass to clear the area. The vehicles following "Brutus" were able to stop, turn around, and withdraw from the kill zone.

d. On hearing "contact" on the radio, the convoy commander of the eastbound convoy turned his two gun-trucks, one maintenance truck, and his jeep around and proceeded to the ambush scene, arriving within 15 minutes. The convoy continued to An Khe. Gun-trucks "Sir Charles," "King Cobra," and "Poison Ivy", began firing suppressive fire with .50-caliber machineguns, M60's, M79's, and M16's on both sides of the road. Because the road was still blocked, the gun-trucks were bunched at the east end of the kill zone.

e. Approximately 15 minutes after the ambush started, six APC's and a tank of the ARVN 1/10th Cavalry arrived at the scene. These vehicles began firing on both sides of the road. The jackknifed tanker was finally moved from the center of the road, and the gun-trucks, APC's, and tanks were then able to move through the kill zone.

f. During the ambush, drivers of disabled vehicles got out of their vehicles and jumped on other vehicles proceeding through the kill zone. These personnel returned fire with their individual weapons. When the gun-trucks were able to proceed through the kill zone, these trucks picked up several US personnel from the disabled vehicles.

g. By 1140 hours, enemy firing had ceased. Two gunships arrived at the ambush scene at this time.

h. Eastbound vehicles disabled included an ARVN 2 1/2-ton, an ARVN 3/4-ton, and a ARVN 1 1/4-ton truck, as well as a civilian Lambretta. These disabled vehicles contributed to the congestion on the road in the kill zone.

4. (C) PERSONNEL PERFORMANCE

a. The convoy commander and all personnel in the 27th Transportation Battalion convoy reacted swiftly and professionally duringthe entire engagement. The ARVN and civilian personnel from the eastbound vehicles made no significant contribution to clearing the kill zone or returning suppressive fire during the engagement.

b. Road security in this area is the responsibility of ARVN; assistance was received from the 1/10th Cavalry and from U.S. gunships.

6. (C) ENEMY FORCES

a. The enemy had a well planned and executed ambush. QL-19 between An Khe and Pleiku was closed to traffic from 211105 November 1970 until 220730 November 1970.

b. The ambush is suspected to have been conducted by NVA, due to the amount of ammunition expended by the enemy and the duration of the engagement. Also, a few enemy were seen to be wearing dark green uniforms.

c. The enemy utilized B40 rockets and AK47's at the convoy ambush. In a coordinated attack at LZ Action, approximately three miles to the esst, which occurred at the same time, mortars, B40 rockets, and small arms were employed.

7. (C) OBSERVATIONS, COMMENTS, AND LESSONS LEARNED

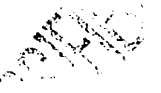
a. Only one troop of the normal ARVN road security forces was present in the area of operations. The other forces had been withdrawn several days earlier for operations west of Pleiku. This condition of extremely thin road security served the enemy's advantage.

b. The ambush was launched at a tine when both eastbound and westbound traffic was in the kill zone, thus presenting a more lucrative target. Because of the two-way traffic, a large number of vehicles were disabled in a short period of time, resulting in the road being quickly blocked. This blockage of the road hindered clearance of the kill zone and kept the gun-trucks from moving through the kill zone to establish a brcader base of suppressive fire.

c. The ambush was very well coordinated in that the nearby fire support base was attacked simultaneously, causing a delay in reaction of supporting fire to the convoy ambush.

d. The ambushed convoy was very lightly defended by gun-trucks. At the time of the ambush, only one gun-truck and one jeep were with the convoy. The armed maintenance truck and convoy comander were approximately two miles behind the convoy working with a vehicle breakdown. A convoy of this size should have had two gun-tracks assigned; however, due to lack of availability of gun-trucks, the armed maintenance vehicle was considered a substitute. As it occurred in this incident, the additional fire power of the maintenance truck was not available during the initial few minutes of the ambush.

e. Communications among the jeeps and gun-trucks was good except during the first few minutes of the ambush, when all stations tried to speak at the same time. All stations not directly involved in the ambush cooperated very well by staying off the radio net.



ANNEX C.

TYPICAL CONVOY CONDUCTED IN RVN

1. (C) This particular convoy took place 28 February-2 March 1971. The mission of the convoy was to transport supplies from Cam Ranh Bay to Camp Dillard, located approximately 60 km southwest of Dalat on QL-20. Camp Dillard is an industrial site for the 815th Engineer Battalion. There were two intermediate stops en route at Don Dhong (HQ's 577th Engineer Battalion) and Duc Trong, *brse* camp for a company of the 577th Engineer Battalion. Class III was unloaded at both intermediate locations.

2. (C) The convoy was composed of 15 S&P's loaded with Classes I, II, IV, and V, twelve 5,000-gallon tankers of Class III; eight bobtzils; one 5-ton wrecker; four 5-ton gun-trucks; two XM-706 armed scout vehicles; one 3/4-ton maintenance truck; six M151 command-and-control jeeps, including one with single-sideband radio; and four 5-ton dump trucks belonging to engineer units along the way.

3. (C) Security consisted of two XM-706's, one of which broke down at Phan Rang and could not continue with the Convoy, four 5-ton gun-trucks, two MP jeeps with M60 machineguns and four transportation unit jeeps with M60 machineguns. A ratio of one shotgunner per five task vehicles was provided as additional security. Between Phan Rang and Camp Dillard there was an O-1 (Bird Cog) aircraft flying cover for the convoy with tactical air and gunship on call. There was no US artillery available.

4. (C) The convoy commander had been furnished with SOI extracts fron units through whose AO's he would pass, including MACV units. Eis instructions were to contact each TOC as he passed through an area, notifying them of his presence, and to note if they did not answer or if he could not contact them. In all cases he was able to contact the TOC's.

5. (U) The convoy was 250 miles, round trip, and took three days to complete. The road is paved to Duc Trong, which is about three-fourths of the way from Cam Ranh Bay to Camp Dillard. The remainder of the road, that portion between Duc Trong and Camp Dillard, went from good, to fair, to bad, to worse within a very short stretch. The dust in some areas was thick enough to reduce visibility to zero and presented a considerable traffic hazard.

6. (U) Prior to the SP, the chaplain, battalion commander, and the battalion executive officer were all present, at the assembly area, and coffee and doughnuts were available for convoy personnel (This is a daily occurrence in this battalion, and such personal attention to the welfare of the men is one reason for the high morale noted in this battalion).

7. (U) The scheduled departure time was set for 0600. However, confusion arose as to the proper assembly area for this convoy, resulting in numerous vehicles not arriving until 0800. Loads were not properly secured and additional tie-downs had to be obtained and installed. The landing legs of

one trailer would not retract properly. After 2 hours this was remedied by cutting off the landing legs. At 0840, the convoy departed the assembly area.

8. (U) All convoy personnel wore flak jackets and steel helmets at the start of the convoy; however, it was observed that few if any of the personnel wore either the flak jacket or the helmet once they were on the road.

9. (U) The trip to Phan Rang was uneventful. At a rest stop at Phan Rang Air Force Base the accelerator cable broke on one of the XM-706's and could not be repaired in time to continue with the convoy. From Phan Rang to the destination the trip was uneventful except for approximately 15 flat tires, which were changed quickly with no significant delay. An additional rest stop was made at Don Duong. The convoy arrived at Camp Dillard at 1605 hours.

10. (U) Upon arrival at the destination, arrangements were made for off-loading the vehicles, and the convoy personnel were released to go the local village, if they desired to do so.

11. (U) The RON facilities at Camp Dillard were adequate in that showers and messing facilities were available. There were no billets for transient personnel, but a large open shed was available for those not sleeping in their vehicles (Normally, the men slept under the vehicles, in the vehicles, or in any place that offered protection from the elements).

12. (U) The convoy departed Camp Dillard at 1140 hours on 1 March and proceeded without incident to Phan Rang, arriving at 1815 hours. The convoy was late getting started because some of the backloads were late in being loaded. The backloads consisted primarily of retrograde machinery and MX-19 airfield landing mats. On the return trip, again approximately 15 flats were experienced, and several vehicles had hot brakes and/or loss of brakes in the mountainous "Anthill" section of QL-11. The trail party again made repairs quickly and without delay. The engineers were working on QL-11, and it was necessary to stop the convoy several times due to roadblocks caused by engineer equipment. This allowed time for the trail party to make necessary repairs and to catch up with the convoy.

13. (U) Due to the late start and the numerous stops on the return trip, it was necessary to RON at Phan Rang. Messing facilities and showers were available 5ut no billets were available.

14. (U) The convoy departed Phan Rang at 0845 hours on 2 March and proceeded without incident to Cam Ranh Bay, closing at 1020 hours.

15. (U) This convoy operetion was typical. No *two* convoys are ever completely alike, but certain similiarities exist. The convoy commander, a captain, was also the conpany commander. His trail party was commanded by a first lieutenant. No major problems arose and no enemy action was encountered.

ANNEX D

MEDICAL ASPECTS OF THE STANDARD DRIVER'S SEAT IN THE FIVE-TON TRUCK

1. References

a. Letter, Headquarters 142d Medical Det APO San Francisco 96384 to CG, USASUPCOM, Qui Nhon, APO San Francisco 96238, undated, subject: Advance Medical Effects on 5-Ton Truck Drivers.

b. Letter, HQ, USA Medical Research Laboratory, Ft. Knox, Ky to CO, ACTIV, 15 March 1971, subject: Drivers Fatigue in 5-Ton Trucks.

2. In the above letters the medical problems associated with the occupation of truck drivers are presented by medical personnel. In reference a, above, the commanding officer of the detachment which supported units of the 8th Transportation Group notes two significant medical problem found in the transportation units: (1) low back pain, and (2) chronic fatigue. The following is quoted from the text of his report:

> "The problem of low back Fain, although seldom disabling to the degree where it required hospitalization or quarters, did cause significant discomfort and, in so doing, decreased their effectiveness and alertness. The majority of those complaining of back pain were truck drivers. In an attempt to determine the etiology of the back pain, several facts were noted:
>
> a. The truck drivers were required to drive long distances daily over unpaved roads.
>
> b. Seat padding in vehicles appeared inadequate as sufficient shock absorbers.
>
> c. It was determined that the transportation drivers were spending approximately 18 hours per day on their assigned mission; approximately 8-10 hours of this tine was actual driving time.
>
> d. Pain, especially that associated with muscle spasm, tends to contribute to the development of fatigue.
>
> "That these represent contributing factors to chronic fatigue is obvious. It is the further opinion of the doctor that the existence of fatigue was of etiologic significance in several vehicular accidents which occurred during this time.
>
> "It is not to be implied that the above problems are unique to the transportation units. They exist in all units where men are subjected to similar conditions. The transportation units have provided the most clinically dramatic cases.

"It is also significant to mention two other clinical conditions which have been seen, that are related to the above noted factors. A number of truck drivers have developed synovial cysts (fluid-filled sacs) overlying the lumbar area (lower back) which arise as a direct result of chronic repeated trauma to the back from the jarring phenomenon, requiring surgical removal to remedy the condition.

The development of prostatitis (inflamation of the prostate gland) is another commonly seen condition. Due to the fact that driving over unpaved roads in vehicles with inadequate shock absorbing capacity aggravates this condition, it often becomes necessary to stop the patient, on a temporary basis, from either driving or riding in vehicles.

"The above conditions have been pointed out because of their relationship and significance to the overall health and effectiveness of the troops involved. The possible consequences which could result are multitudinous. More specifically, as regards this present investigative survey, these medical conditions can lead to an overall decrease in accomplishing the unit mission due to failure to maintain equipment as a result of sick call, quarters, and hospitalization, etc.

"The pints ere demonstrated because it is felt that certain fectors can be remedied by specific countermeasures which would be designed *to* decrease the prolonged hours of work, and to provide more effective means of decreasing the ...."

3. In reference b above, the Commanding Officer, US Army Medical Research Laboratory ststed that medical channels *are* aware of the existing problem of the 5-ton truck seats and that series 809 is being equipped with a hydralic spring dampened seat. This retrofit, however, is not available for installation within present vehicles, because the seat requires more space for proper installation than the present cab allows. Installation of this seat in present cabs results in crowding of the foot-operated controls for those drivers whose stature is in the 95th percentile.

Reference b further notes three other reports that further document the problem and the efforts to alleviate this end related problems. They are as follows:

a. A study of "truck ride" characteristics of standard cushion vs. suspension-type seats in military vehicles, by Simons, A. K.; Radke, A. O.; and Oswald, W. C. Contract DA 11-022-ORD-1999, Ord Project TTI-696, DA Project 5T7201001, Final Report, March 1956, 60 pp., Detroit Arsenal and Aberdeen Proving Ground, Aberdeen, Maryland. This study dealt with factors of vibration as related to truck drivers, using electronically measured

stress over various terrains. A comparison of the types of seats was also made.

b, An evaluation technique and feasibility study of shock and vibration protection for an experimental driver's seat in the 8-ton 4x4 cargo truck, XM502E1 by King, D.M., and Lea, J.H., AMCMS code 5569.12.24008, Tech Memo, 1963, June 1963, 72 pp., USA Ordnance Human Engineering Labs, Aberdeen Proving Grounds, Md. This study presents an evaluation of shock and vibration to determine the possibility of improving the seat for the driver of the 8-ton, 4X4 cargo truck, XM520E1. Results of this study were instrumental in the design of a new experimental seat. A comparison of this seat and the present vehicle seat is made.

c. Randall, F.E. Seat Comfort, Mechanical Engineering, Dec 1946, Office of the Quartermaster General, Washington, D.C. This is an article on seat comfort which discusses the theory of seating design. It further discusses primary causes of fatigue, the design factors related to eliminating discomfort, and the principles involved in meeting actual seating requirements.

ANNEX E

DELIBERATE ROAD SWEEP OPERATION

The following is an account of one nine sweep as observed by the ACTIV evaluator. This sweep is described to show the mechanics of a sweep as well as some of the problems that were encountered. The specific problems are not necessarily typical, but similar problems were encountered on virtually every sweep.

a. The road to be swept was a one-lane, laterite, improved road across rice paddies, with many culverts. The road traveled through rolling hills with many sharp turns. Jungle grew to the edge of the road in many places, affording the enemy many excellent ambush sites:

b. At the evening briefing at the Combat Engineer Company, a platoon leader was detailed to conduct the road sweep the following morning, to enable engineer teams to rezch their work sites. He, In turn, informed his flight sergeant, and preliminary plans were'rnade. Plans in this case were only rudimentary, because the platoon performed the same sweep about every third day and detailed planning for the specific sweep was not required.

c. The sweep was scheduled to depart camp at 0700 hours; however, due to minor personnel and equipment problems, the departure was late. The sweep team arrived at the village where they were to meet the ARVN security element and had to wait 15 minutes for their arrival. Time was not critical since the sweep was being conducted for engineer road-building crews. Had they been clearing the road for a tactical convoy, either the convoy would have been delayed or the mine sweep would have had to be rushed.

d. A hasty sweep was conducted for the first three miles, consisting of two loaded 5-ton dump trucks being backed along the road. The "headache boards" were removed to protect the driver in the event of detonation.

e. Due to an earlier coordination error, only two detectors were available for the deliberate sweep, one AN/P-153 metallic detector and one AN/PRS-7 nonmetallic detector, The platoon leader elected to have one work each side of the road. To employ then in a backup configuration (one behind the other) would have doubled the time required to conduct the sweep, The battery in the AN/P-153 was down to a point at which the detector was not dependable. Shortly thereafter a vehicle arrived with en operable AN/PRC-25 radio for the point element, and one AN/P-153. The detector had been used for only 10 minutes when the connection nearest the search head broke. The battery was removed and put into the other AN/P-153 detector and the sweep continued,

f. The makeup of the sweep team was as follows: Three'point men including a Kit Carson scout, one AN/PRS-7 on one side of the road and one AN/P-153 on the other, four or five prober/security men backing up each, detector operator, medical aid man, interpreter, platoon sergeant, platoon leader, demolition specialist, one platoon of ARVN security dispersed throughout the column, two 5-ton dump trucks as proof vehicles, command vehicles, and engineer equipment. There was no security vehicle as such'.

g. The search conducted by the point element was thorough. The point men checked all culverts as well as the road shoulders, They did, on occasion, get out of sight of the main element. The security element seemed to he sufficient in number. The ARVN platoon stayed on the road as there were other ARVN conducting sweeps in the area. The detector operators, for the most part, were thorough. They moved at, roughly, a quicktime pace. A buried ammo can was blown in place, using C4 and tine fuze. There was no secondary explosion.

h. The proof vehicles backed the entire length behind the sweep team and staggered their positions *en* the road to cover the roadway as completely as possible for undetected pressure-detonated nines.

i. The sweep was concluded at 1145 hours, approximately 9 miles fron the starting point.

ANNEX F

REPORT OF FIELD TESTING OF THE AN/PRS-7 MINE DETECTOR

1. The 4th Infantry Division conducted field testing of the AN/PRS-7 mine detector during the period 7 April 70 to 1 May 70. Testing was conducted at Camp Radcliff under controlled conditions and in the area of operations under actual combat conditions. Methodology, Data and Observations are presented as inclosures 1, 2, and 3 respectively.

2. Conclusions:

a. The AN/PRS-7 is better than the AN/PRS-4 as a detector of nonmetallic objects.

b. The AN/PRS-7 is better than the AN/P-153 as a detector of nonmetallic objects.

c. The AN/PRS-7 compares favorably, but is not equal to the AN/P-153 as a detector of metallic objects.

3. The 4th Infantry Division recommends:

a. The AN/PRS-7 mine detector be produced in quantity to replace the AN/PRS-4 detector.

b. Minor technical corrections be made which:

(1) Strengthen the short handle.

(2) Correct false signals by tilting the detector head.

(3) Protect the detector head antenna from abrasive damage. A thin polyethylene or rubber shield would suffice.

(4) Strengthen the signal produced by the detector.

c. Operators must be given extensive training on the AN/PRS-7 detector to insure the instrument performs effectively and efficiently.

Enclosure 1 (Methodology) to AI/PRS-7 Report

1. Testing was conducted in both controlled and field environments. The overall report includes two phases of testing, an initial phase and a secondary phase.

a. The initial phase in controlled testing used four different type soils and eight different objects. Each object was tested in at least three different soil types. Six detector operators were employed with varying degrees of experience. A limited comparison was made with the polan model 153 metallic detector under dry and wet soil conditions. The field test involved sweeping the shoulders of QL19 for a distance of 1500 meters west of An Khe.

b. The secondary phase in controlled testing used three different type soils and four non-metallic objects. The tests concentrated on non-metallic detection and a limited subjective comparison was made with the AN/PRS-4. No wet testing was made during this phase. Field testing was conducted in support of an actual combat mission. Five operators with excellent hearing were chosen for this phase out of twenty candidates tested by audiometer.

2. Several variables were used in the controlled portion of the testing. Eight different objects were used to vary size, shape, metallic and non-metallic characteristics.

Phase I

a. Soil types (taken dry and wet).

(1) Clay base-taken from a borrow pit at Camp Radcliff.

(2) -sand- taken from the bed of the Song Ba River, Camp Radcliff.

(3) Silt- taken from a pit adjacent to the Song Ba. This test soil had some sand and clay in it.

(4) Laterite type- taken from a pit at the base of Dragon Mountain near Pleiku. This soil was not laterite but possessed construction qualities that made it useful as a laterite substitute for road fill.

b. Objects used.

(1) Russian TM1 metallic AT mine.

(2) Chicom metallic AT mine.

(3) Viet Cong "home made" metallic AT mine.

(4) East German plastic AT mine with metallic detonator.

(5) Viet Cong "basket mine", explosive filled sand bag with metallic detonator.

(6) Viet Cong "slap stick" firing device consisting of two strips of bamboo (about 8" long and 2" wide) covering two flashlight batteries.

(7) Chicom 82mm mortar round emplaced vertically, tail fins up. UNCLASSIFIED

(8) Soft drink can, emplaced in an upright position.

c. Test personnel.

(1) The O.C., who acted as recorder.

(2) The [redacted], who was experienced with the P153 and participated as operator number 1.

(3) Three personnel experienced with the P153.

(4) Two personnel with no previous practical experience other than AIT.

Phase II

a. The first three soil types described in Phase I were used in the second phase. The consistency of the fourth soil was changed after the wet testing of Phase I and was not replaceable.

b. Objects used.

(1) East German plastic AT mine with detonator.

(2) Above mine without detonator.

(3) Viet Cong "basket mine".

(4) Viet Cong claymetal mine.

c. Test personnel were chosen on a basis of a high average GT score and excellent audiograms from audiometer testing. Prior experience with metallic mine detectors ranged from minimal to extensive.

3. Testing was conducted from 0730 to 1630 hours during month of April 70. In general, the weather was cloudy and warm during the morning hours, but clear, dry and hot during the afternoon. The humidity was moderate. In systematic procedure, the test objects were distributed in the lanes of the test pit. Each operator was required to sweep all lanes, the objects redistributed, and the lanes swept again. Recorded information included the operator's name, weather, time, soil lane, whether or not an object was detected, and the operator's estimation of what type object was buried. False signals were observed but not recorded since they were not numerous.

4. Wet season conditions were simulated during Phase I by wetting down the test pit with approximately 3,000 gallons of water. Only one distribution of test objects was evaluated under these conditions. Three lanes were super-saturated to a depth of approximately two feet. The other lane, sand, was saturated and covered with 8 to 10 inches of water.

UNCLASSIFIED

[redacted]

1. Phase I Results Dry Soil AN/PRS-7 Objects Detected:

Type Object	Clay	Silt	Sand	Laterite Sand
Russian AP	100% 6of6	100% 6of6	100% 6of6	100% 6of6
VS AT	100% 6of6	100% 6of6	100% 6of6	100% 6of6
Chicom AT	100% 6of6	100% 6of6	100% 6of6	100% 6of6
Plastic mine	50% 3of6	100% 6of6	33% 2of6	100% 6of6
Basket mine	50% 3of6	17% 1of6	50% 3of6	83% 5of6
Slap Stick	0	33% 2of6	83% 5of6	33% 2of6
82mm Mortar	50% 3of6	33% 2of6	33% 2of6	100% 6of6
Soda Can	67% 4of6	50% 3of6	0	67% 4of6

2. Comparison with Polan Model 153 detector: The 153 detector was exercised with the test objects in only one distribution of test series. The operators had no apparent difficulty detecting all the test objects with metallic parts. The metallic parts of the plastic, basket mine, and slap stick mine firing devices were sufficient to cause detection. The metallic 82mm mortar round and tin can produced strong signals. The 153 detector could not pick up an object with no metallic parts.

3. Phase I Results (wet soil) AN/PRS-7 (See Observations and Comments, Inclosure 3)

4. Operator Performance Phase I (controlled tests) AN/PRS-7

	Objects Detected	Total Available	Percentage
Operator 1 (experienced)	23	32	71.9
Operator 2 (experienced)	18	32	56.2
Operator 3 (experienced)	28	32	87.5
Operator 4 (slight experience)	21	32	65.6
Operator 5 (inexperienced)	21	32	65.6
Operator 6 (inexperienced)	23	32	71.9

Inclosure 2 (Tabular Data) to AN/PRS-7 Report

5. Phase II Results (Dry soil) AN/PRS-7 Objects Detected:

Type Object	Sand	Clay	Silt
Plastic AT	27% 4of15	81% 17of21	64% 9of14
Plastic AT w/out detonator	38% 5of13	85% 17of20	80% 16of20
Basket mine	62% 18of29	67% 20of30	67% 20of30
Slap stick	40% 6of15	47% 7of15	57% 8of14

6. Phase II Results (Dry soil with plastic covering on mines) AN/PRS-7 Objects Detected:

Type Object	Sand	Clay	Silt
Plastic AT	100% 4of4	100% 4of4	100% 4of4
Plastic AT w/out detonator	100% 4of4	100% 4of4	100% 4of4
Basket mine	100% 4of4	50% 2of4	100% 4of4
Slap stick	50% 2of4	not tested	33% 3of9

7. Discussion of road sweeps in both phases is at Annex C (Observations and Comments).

8. A subjective judgement was made of the AN/PRS-4 from limited handling and discussion with personnel having used it prior to this testing. The most common complaints were the multitude of false signals rendering the detector ineffective and the burdensome size of the detector. No tested evaluation was made and no data is available.

Inclosure 3 (Observations and Comments) to AN/PRS-7 Report

1. The purpose of this inclosure is to discuss performance of the AN/PRS-7 during field testing and to note important observations and operator comments.

2. During the Phase I field test on route 1019, the AN/PRS-7 did not produce an excessive number of undesired or "false" signals. However, signals caused by small metallic fragments were quite similar to those resulting from non-metallic mines or small cross-section metallic mines. The shoulders of the road consisted of very highly compacted soil with a high rock and gravel content. In addition, the road and shoulders were strewn with metallic debris. One VS bucket mine was discovered in a pot hole about two feet into the roadway by visual sighting on the part of an alternate operator. The detector was passed over the spot and a definite signal was received. No mines were detected solely by the AN/PRS-7, however no mine incidents subsequently occurred that day on the section of road swept by the AN/PRS-7 team. The distance covered by the operators per 30 minutes operating time ranged from 60 meters at the beginning of testing to 200 meters at the end at the end of the first 1000 meter stretch. Signals caused by metallic debris became less objectionable as the operators learned to recognize them.

3. The Phase II field test was conducted in support of an actual combat mission on [illegible] 503 about 15 miles from An Khe. Five sweeps were made over a distance of one kilometer and one sweep was made over a distance of four and a half kilometers. The weather was clear, hot and dry. The soil was hard packed, rocky clay. The field testing produced no decisive results as no mines were encountered. On actual mine sweeps [illegible] a mine the day after another section of road was swept. No correlation can be made between the efficiency of the AN/PRS-7 and the mine incidents due to the 24 hour time lapse.

4. The operators were familiarized with the instruments prior to each test phase. Classes of instruction were given and practice sessions were held for training personnel to use the AN/PRS-7. The sweep method prescribed by the FM5-6[illegible]-193-15 (para 2-9a, pg. 2-7) was taught to all operators and adhered to in controlled pit testing as well as on road mine sweeps.

5. A critical assessment was made of the AN/PRS-7 and observations noted as follows:

a. The signal produced by the detector was of insufficient strength to allow the operator to sweep without maximum concentration. This effort is tiring on a road sweep and makes detecting virtually impossible when combined with many random loud noises produced by traffic nearby. Operators had to stop often during periods of frequent helicopter activity. Experienced operators noted that the r153 detector produced a stronger signal making detection easier.

b. All operators noted that false signals could be produced by the action of tilting the detector head out of the horizontal position.

c. The antennae in the detector head are unprotected from common incidents such as abrasion by rocks or hard surface soil. A foam pad or rubber shield might be affixed to the bottom surface without altering detection capability.

d. The short handle on one AN/PRS-7 cracked while on operations during Phase II testing. It is not known how it was cracked as it was discovered one morning by the NCOIC of the test team. The short handle should be strengthened to withstand various instances of abuse which will arise. In addition, several persons noted trouble in fastening the quick-connect coupling on the long handle to sufficient tightness.

e. All personnel felt the size and compactness of the AN/PRS-7 was a great improvement over previous mine detectors and made the detector less burdensome.

f. It is anticipated that extensive training of the operators who will be using AN/PRS-7 detectors can correct deficiencies noted to a major degree, especially those mentioned in a, b, c, and d above. A good training program should be stressed to enhance the effectiveness of the detector.

g. During the wet soil testing of Phase I, signals from the AN/PRS-7 were more readily recognized. All objects were either detected, as a minimum, or completely identified in the wet soil.

h. As a possible masking device some mines were covered with sheet plastic. This served to the contrary, however, producing better detection results. See Inclosure 2, paragraph 6.

i. Several of the operating personnel noted that in detecting small objects the detector will give an initial signal, but on some occasions will not produce further signals in subsequent passes of the search head. Also, small objects were difficult to outline and identify. As a result, signals from small objects were occasionally disregarded. This might be remedied by special training programs for AN/PRS-7 detector operators.

j. The POINT modes of the AN/PRS-7 functioned effectively with objects of relatively large and regular cross-sections. Objects with small cross-sections (such as vertically emplaced mortar rounds or tin cans) were difficult to outline and were usually identified by the signal produced in the SMALL mode. Selection by the operators of POINT-HIGH, -MID, -LOW was a function of operator preference rather than characteristics of the particular soil being tested. Considerable background noise in the test areas resulted in a definite preference for the HIGH and MID settings.

6. Personnel using the AN/PRS-7 detector were asked to criticize the instrument and made the following two noteworthy comments:

a. " The detector has to pass directly over an object in order to detect it, where the old mine detector (=153 metallic detector) would detect an object without passing directly over it."

b. " There is little chance a trained operator would not be able to detect the signals of a plastic mine as opposed to a small scrap of tin. However, the necessity for rapid movement while on a sweep makes it impossible for the operator to check out each signal he receives. This is why it takes an experienced operator to differentiate between a mine and some foreign sound while maintaining a fast pace."

ANNEX G

UNITS SURVEYED

SAIGON SUPPORT COMMAND

4th Transportation Command
6th Transportation Battalion
7th Transportation Battalion
10th Transportation Company
47th Transportation Company
63d Transportation Company
233d Transportation Company
261st Transportation Company
321st Transportation Company
379th Transportation Company
534th Transportation Company
538th Transportation Company

18TH MILITARY POLICE

16th Military Police Group
89th Military Police Group
93d Military Police Battalion
97th Military Police Battalion
504th Military Police Battalion
720th Military Police Battalion
A Co, 720th Military Police Battalion
B Co, 720th Military Police Battalion
C Co, 720th Military Police Battalion
68th Military Police Company
127th Military Police Company
560th Military Police Company

DA NANG SUPPORT COMMAND

8th Transportation Group
39th Transportation Battalion
57th Transportation Battalion
2d Transportation Company
23d Transportation Company
57th Transportation Company
64th Transportation Company
363d Transportation Company
515th Transportation Company
529th Quartermaster Company
563d Transportation Company
572d Transportation Company
585th Transportation Company
805th Transportation Company

QUI NHON SUPPORT COMMAND

27th Transportation Battalion
88th Transportation Company
359th Transportation Company
444th Transportation Company
512th Transportation Company
545th Transportation Company
597th Transportation Company

CAM RANH BAY SUPPORT COMMAND

24th Transportation Battalion
442d Transportation Company
566th Transportation Company

US ARMY ENGINEER COMMAND, VIETNAM

18th Engineer Brigade
20th Engineer Brigade
45th Engineer Group
159th Engineer Group
937th Engineer Group
8th Engineer Battalion
14th Engineer Battalion
20th Engineer Battalion
26th Engineer Battalion
27th Engineer Battalion
31st Engineer Battalion
39th Engineer Battalion
299th Engineer Battalion
328th Engineer Battalion
173rd Engineer Company
919th Engineer Company
A Co, 7th Engineer Battalion
A Co, 14th Engineer Battalion

B Co, 20th Engineer Battalion
A Co, 26th Engineer Battalion
B Co, 26th Engineer Battalion
C Co, 26th Engineer Battalion
D Co, 26th Engineer Battalion
E Co, 26th Engineer Battalion

A Co, 31st Engineer Battalion
B Co, 31st Engineer Battalion
C Co, 31st Engineer Battalion
B Co, 65th Engineer Battalion
C Co, 299th Engineer Battalion

1ST AVIATION BRIGADE UNITS

17th Combat Aviation Group
72d Combat Aviation Group
164th Combat Aviation Group
165th Combat Aviation Group
10th Combat Aviation Battalion
11th Combat Aviation Battalion
52d Combat Aviation Battalion
145th Combat Aviation Battalion
212th Combat Aviation Battalion
222d Combat Aviation Battalion
223d Combat Aviation Battalion
268th Combat Aviation Battalion
21st Aviation Company

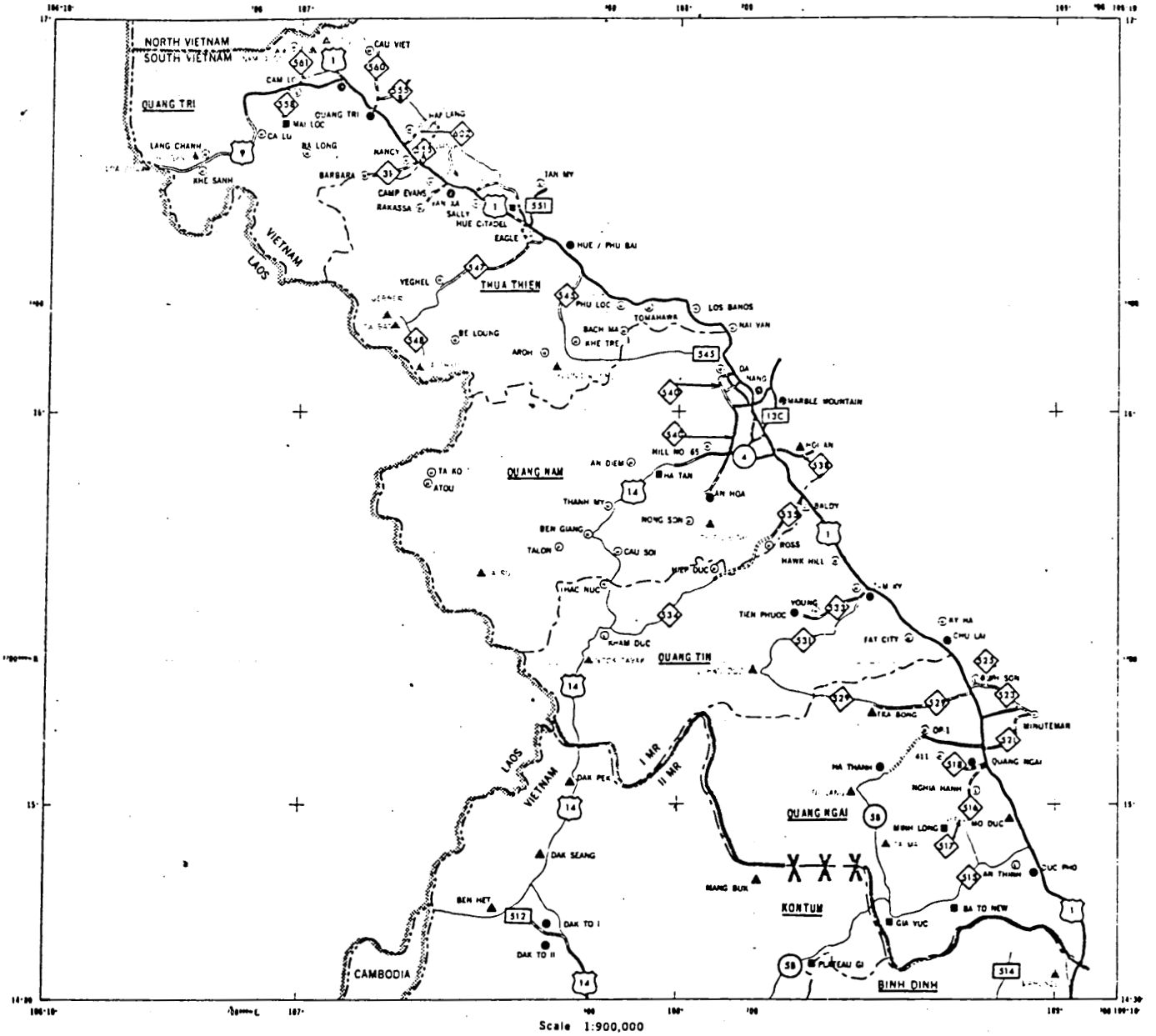
61st Assault Helicopter Company
74th Aviation Company
92d Assault Helicopter Company
117th Assault Helicopter Company
118th Assault Helicopter Company
129th Assault Helicopter Company
134th Assault Helicopter Company
135th Assault Helicopter Company
162d Assault Helicopter Company
191st Assault Helicopter Company
192d Assault Helicopter Company
282d Assault Helicopter Company
335th Assault Helicopter Company

DIVISION/BRIGADE AVIATION UNITS

II Field Force Vietnam
1st Infantry Division
1st Cavalry Division - Airmobile
23d Infantry Division
1st Brigade, 5th Infantry Division - Mechanized
11th Armored Cavalry Regiment
16th Combat Aviation Group
123d Combat Aviation Group
123d Combat Aviation Battalion
116th Assault Helicopter Company
176th Assault Helicopter Company
178th Assault Helicopter Company

ANNEX H

I MR MAJOR ROAD NET & AIRFIELDS



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COMPILED BY 579th ENGR DET (TERR)

DRAFTED BY 66TH ENGR CO (TOPOXCORPS) AUG 70
AVAILABLE AT THE 547TH MAP DEPOT
PRINTED BY 66TH ENGR CO (TOPOXCORPS) 1-71

ROAD CLASSIFICATIONS

- CENCOM STANDARD ROAD
- CLASS 31 ROAD
- CLASS 18 ROAD
- CLASS 5 ROAD
- STATUS OF ROAD NOT KNOWN OR CLOSED
- NATIONAL ROUTES (QL)
- INTERPROVINCIAL ROUTES (LTL)
- PROVINCIAL ROUTES (TL)
- SUPPLEMENTARY ROUTES (RTE)
- COMMUNAL ROUTES (HL)

AIRFIELDS

	ABANDONED	CLOSED	OPEN
C-130			
C-123			
C-7A			
LIGHT AIRCRAFT			
MAJOR HELIPORT			

NOTE: Numbers within aircraft classification symbol denote the current surface standard. See MACV Directive 415-9 for criteria.

OTHER FEATURES

- INTERNATIONAL BOUNDARY
- PROVINCE BOUNDARY
- PROVINCE NAME — KONTUM
- RAILROADS
- QUARRY SITES FOR MACV LOC

NOTE:
For detailed information see 66th Engr. Gp. or XXIV Corps Engr. Sect.
Airfields show normal classification as of date of publication and are subject to change.

II MR MAJOR ROAD NET & AIRFIELDS

(DIRECTORY OF ROADS AND AIRFIELDS ON REVERSE SIDE)

AIRFIELDS

	ABANDONED	CLOSED	OPEN
C-130	⊙	⊙	⊙
C-123	▣	▣	▣
C-7A	△	△	△
LIGHT AIRCRAFT	⊙	⊙	⊙

NOTE: Numbers within aircraft classification symbol denote the pavement airfield standard. See MACV Directive 415-9 for criteria.

MAJOR HELIPORT ⊙

ROAD CLASSIFICATIONS

- CENCOM STANDARD ROAD
- CLASS 31 ROAD
- CLASS 18 ROAD
- CLASS 5 ROAD
- STATUS OF ROAD NOT KNOWN OR CLOSED
- NATIONAL ROUTES (QL)
- INTERPROVINCIAL ROUTES (LTL)
- PROVINCIAL ROUTES (TL)
- SUPPLEMENTARY ROUTES (RTE)
- COMMUNAL ROUTES (HL)

OTHER FEATURES

- INTERNATIONAL BOUNDARY
- PROVINCE BOUNDARY
- PROVINCE NAME PLEIKU
- RAILROADS
- QUARRY SITES FOR MACV LOC *

NOTES:

For detailed information and corrections contact IFFV Engineer Section, APO 96350.

10 5 0 10 20 30 40 Statute Miles

10 5 0 10 20 30 40 50 60 70 Kilometers

10 5 0 10 20 30 Nautical Miles

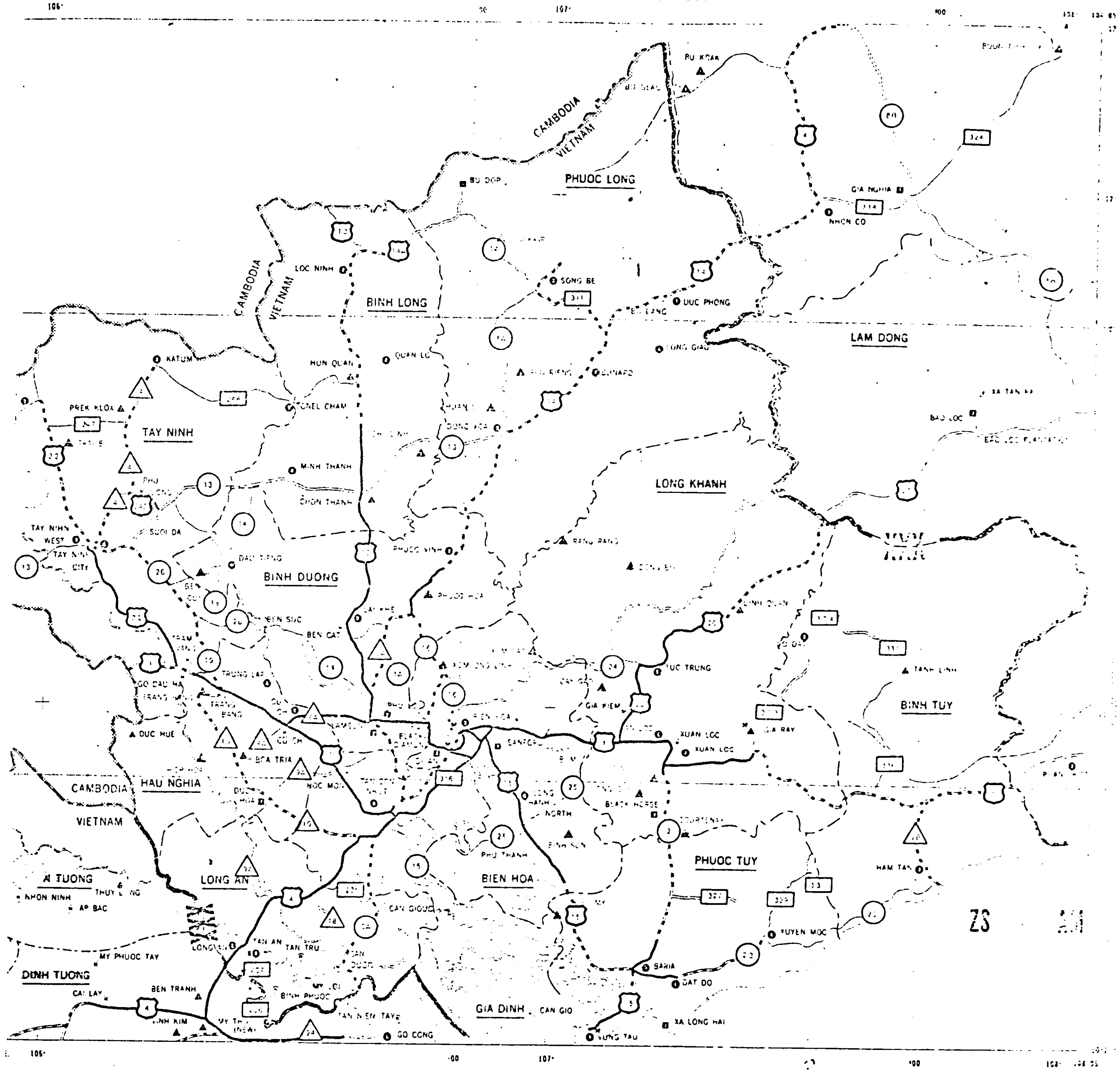
10 JUNE 70

BASE COURSE COMPLETED

SUB GRADE PREPARATION

COMPILED BY IFFORCEV ENGINEER SECTION
DRAFTED BY 66TH ENGR CO (TOPO) (CORPS) JUNE 70
AVAILABLE AT THE 547TH MAP DEPOT
PRINTED BY 66TH ENGR CO (TOPO) (CORPS) 6-70

III MR MAJOR ROAD NET & AIRFIELDS



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66TH ENGR CO (TCPC)(CORPS) AUG 70
AT THE 547TH MAP DEPOT
66TH ENGR CO (TCPC)(CORPS) 9 70

ROAD CLASSIFICATIONS

- CENCOM STANDARD ROAD
- CLASS 31 ROAD
- CLASS 18 ROAD
- CLASS 5 ROAD
- STATUS OF ROAD NOT KNOWN OR CLOSED
- NATIONAL ROUTES (QL)
- INTERPROVINCIAL ROUTES (LTL)
- PROVINCIAL ROUTES (TL)
- SUPPLEMENTARY ROUTES (RTE)
- COMMUNAL ROUTES (HL)

AIRFIELDS

	ABANDONED	CLOSED	OPEN
C-130			
C-123			
C-7A			
LIGHT AIRCRAFT			
MAJOR HELIPORT			

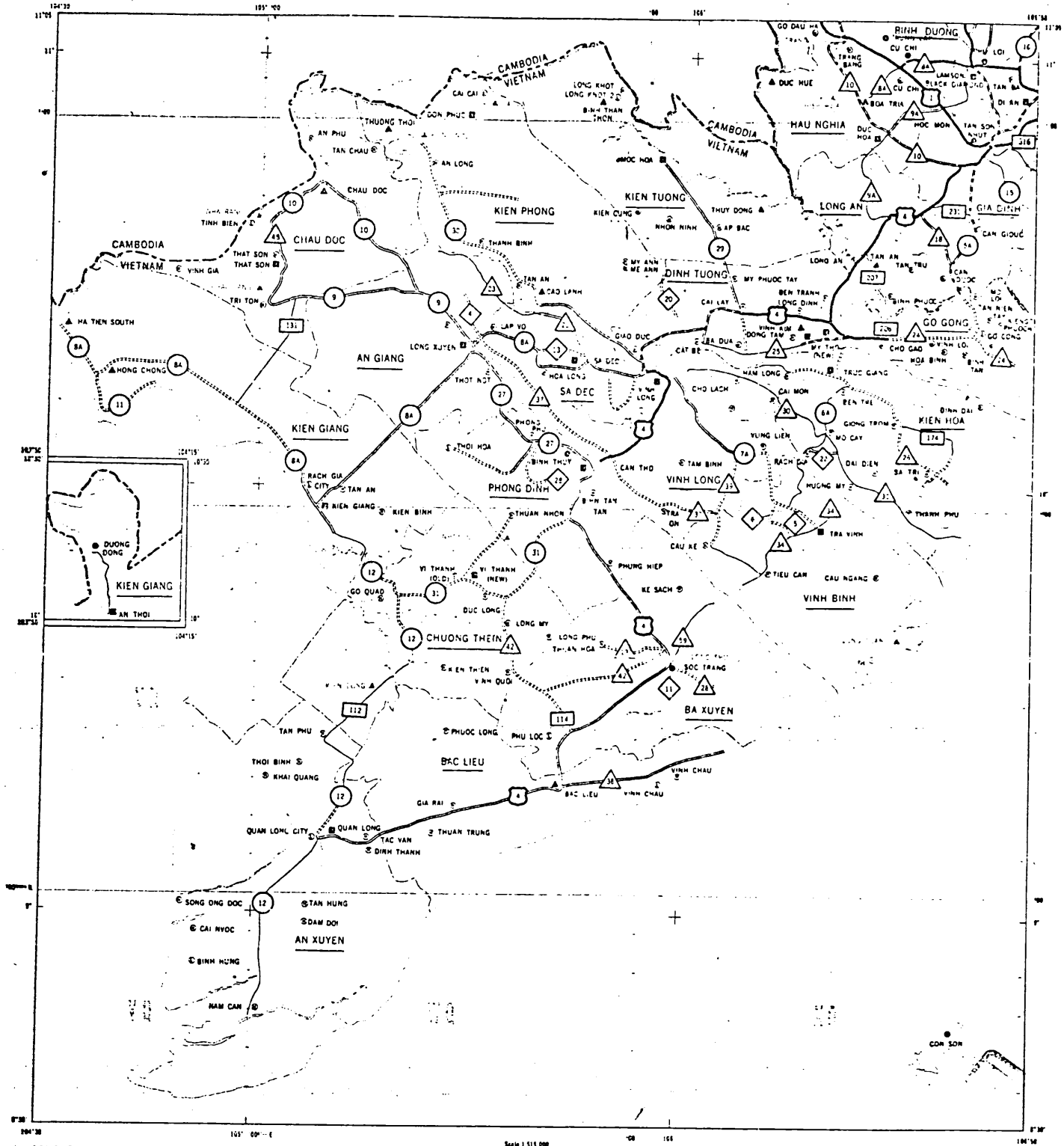
NOTE: Numbers in the aircraft classification symbol denote the current airfield standard. See MACV Directive 415-9 for criteria.

OTHER FEATURES

- INTERNATIONAL BOUNDARY
- PROVINCE BOUNDARY
- PROVINCE NAME — BIEN HOA
- RAILROADS
- QUARRY SITES FOR MACV LOC

NOTES
For detailed information see 20th Engr Bde Bridge Route Data III MR 517th Engr Det (Terr). Airfields show normal classification as of date of publication and are subject to change.

IV MR MAJOR ROAD NET & AIRFIELDS



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ROAD CLASSIFICATIONS

- CENCOM STANDARD ROAD
- CLASS 3I ROAD
- CLASS 1B ROAD
- CLASS 5 ROAD
- STATUS OF ROAD NOT KNOWN OR CLOSED

- NATIONAL ROUTES (QL)
- INTERPROVINCIAL ROUTES (LTL)
- PROVINCIAL ROUTES (TL)
- SUPPLEMENTARY ROUTES (RTE)
- COMMUNAL ROUTES (HL)

AIRFIELDS

	ABANDONED	CLOSED	OPEN
C-130			
C-123			
C-7A			
LIGHT AIRCRAFT			
MAJOR HELIPORT			

NOTE: Numbers within a symbol classification indicate the country the current airfield standard. See MACV Directive

OTHER FEATURES

- INTERNATIONAL BOUNDARY
- PROVINCE BOUNDARY
- PROVINCE NAME (BIEN HOA)
- RAILROADS
- QUARRY SITES FOR MACV LOC

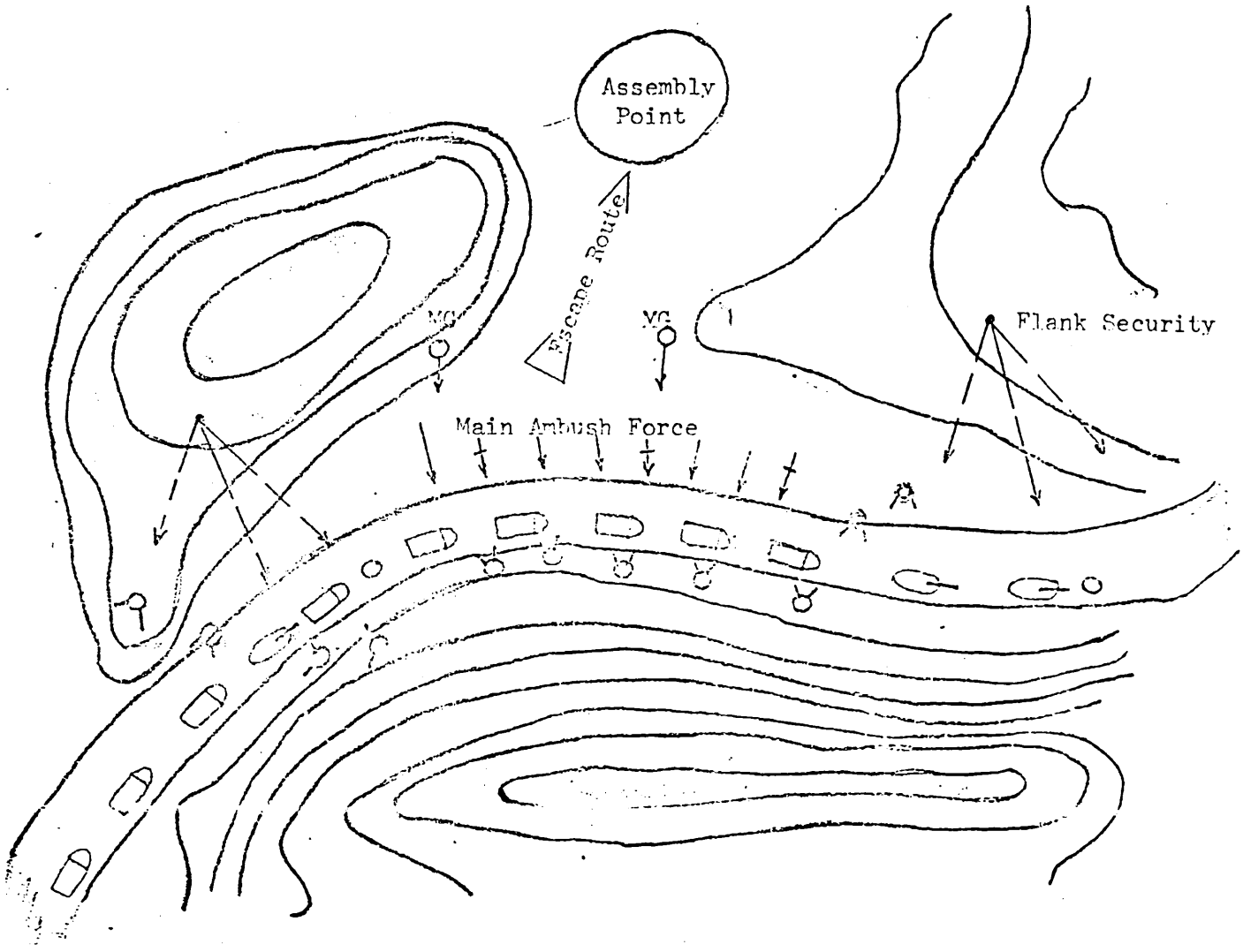
NOTES
For detailed information see 20th Engr Bde Bridge Route Data in MR 517th Engr Det (Terr) Airfields show normal classification as of date of publication and are subject to change

ANNEX I

ILLUSTRATIONS AND DISCUSSION OF VC AMBUSH FORMATIONS

1. VC doctrine called for the use of good camouflage and concealment, observation, fields of fire, and sufficient maneuvering room. The enemy mission was, primarily, to capture or destroy friendly equipment, to inflict maximum casualties, and to gain the propaganda value of a victory; seldom was the ambush designed to gain control of an ares. Every effort was made to position their troops to maintain the initiative from the outset of the ambush and to cause friendly forcest pretreator flee in panic. A signal to open fire was predesignated in order to coordinate the attack. Sniper fire was sometimes used as a deceptionin order to give the impression that only a small force was in the area; then, after the opposing force had completely entered the kill zone, maximum fire power was commenced. An aggressive assault was then conducted which was intended to split and segregate the opposing column in order to annihilate it.

2. There ere five common ambush formations used against motor columns. These are the linear ambush, the L-formation ambush, the V-formation ambush, area ambush, and the Z-formation. Figures I-1 through I-5 show the diagrams of each.



o Command-detonated Antitank Mines

Directional AP Mine

FIGURE I-1 (U). Linear Ambush.

3. In the linear ambush (Figure I-1) the attack force is deployed generally parallel to the target route of movement. This positions the attack force parallel to the long axis of the kill zone and subjects the target to heavy flanking fire. The size of the target which can be trapped in the kill zone is limited by the area which the attack force can effectively cover with a heavy volume of fire. The target is trapped within the kill zone by natural obstacles, mines (claymore, antivehicular, antipersonnel), demolitions, and direct and indirect fire. A disadvantage of the linear formation (to the enemy) is the chance that lateral dispersion of the target may be too great for effective coverage; an advantage of the line formation, however, is its relative ease of control under all conditions of visibility.

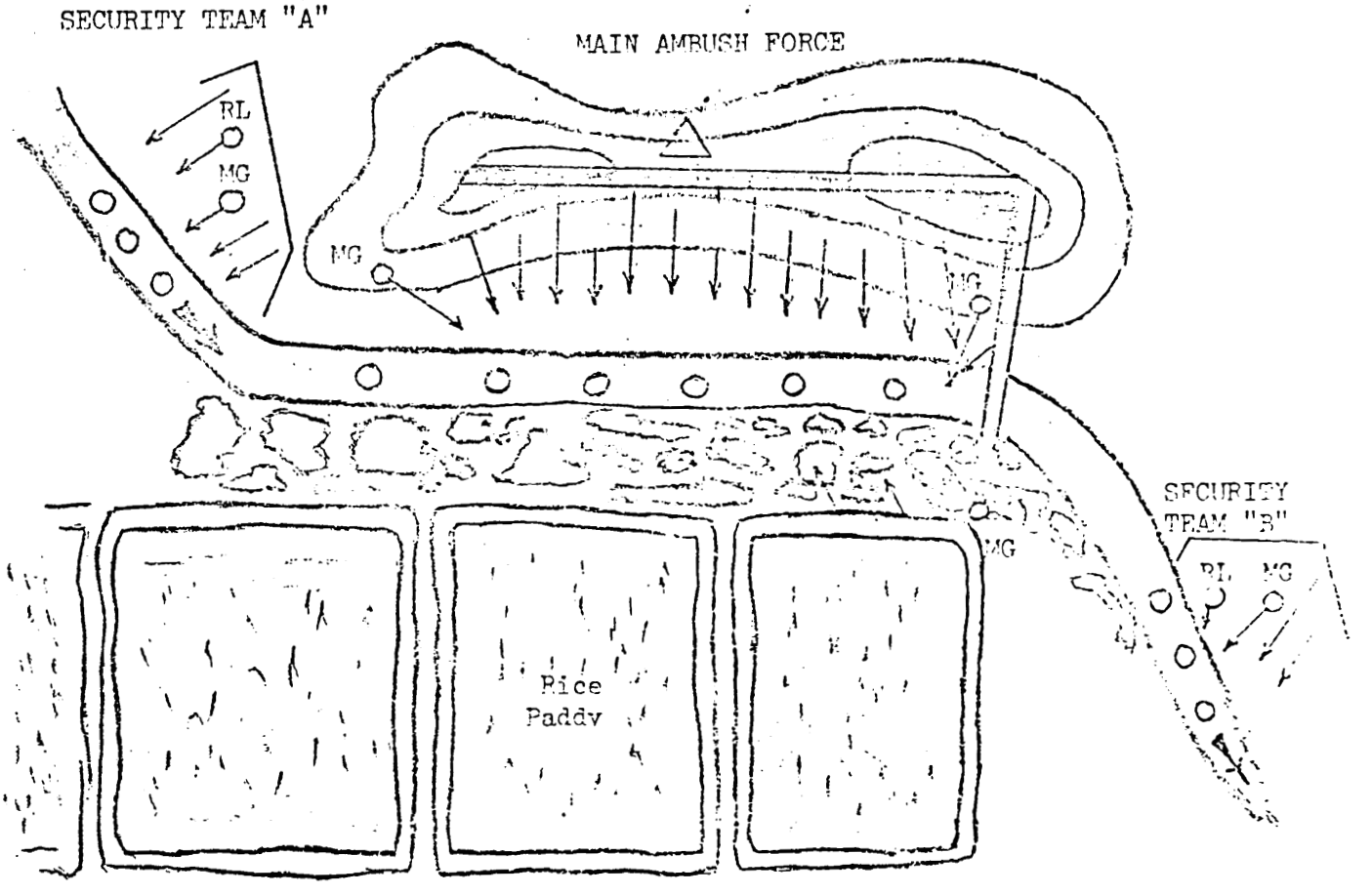


FIGURE I-2 (U). L-Formation Ambush.

). In the "L" formation (Figure I-2), the main ambush force digs into a position overlooking the portion of the road where the kill zone has been located. Opposite the main force, an automatic weapon covers a secondary kill zone where men are trapped as they flee from the direction of fire from the main ambush force.

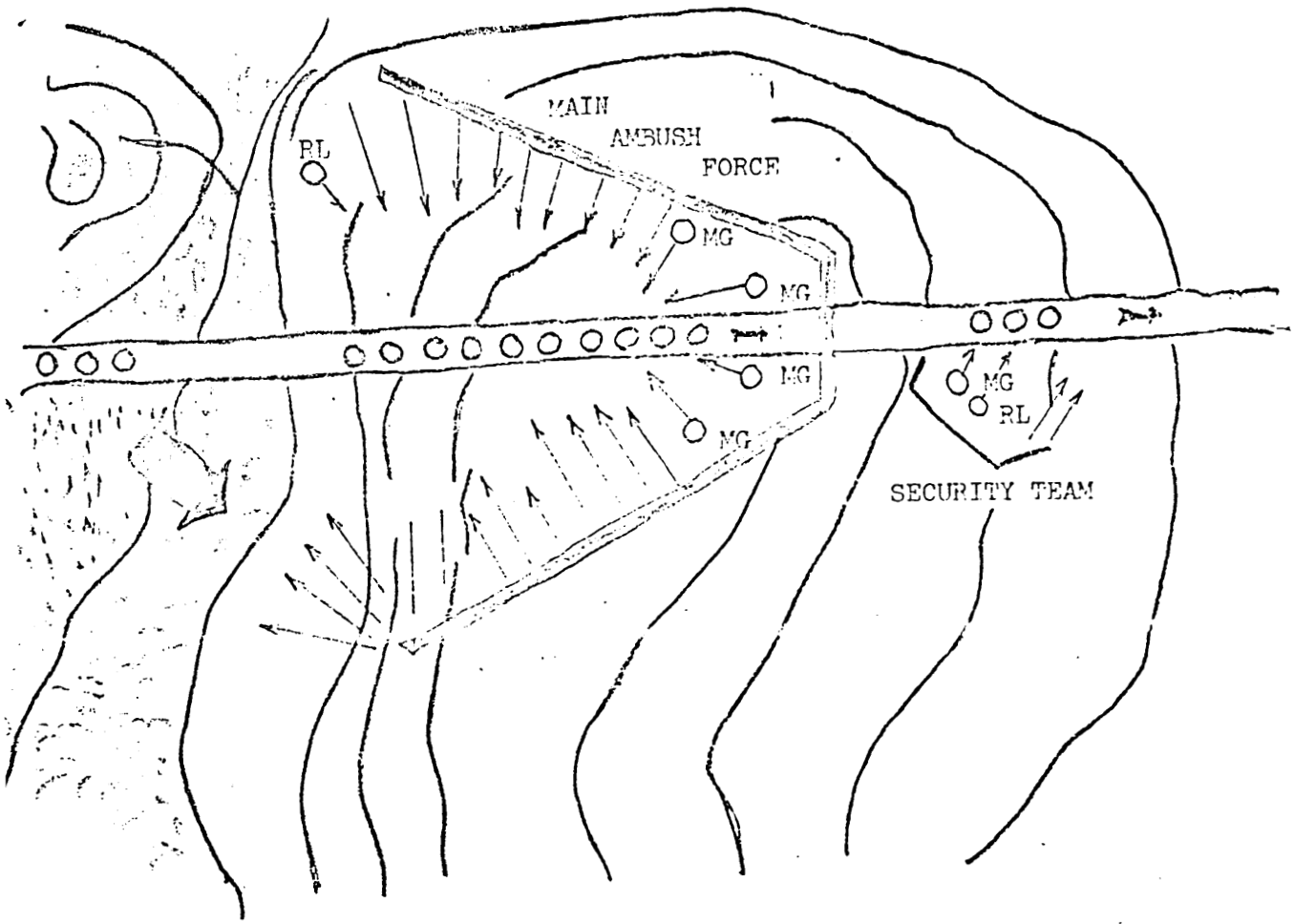


FIGURE I-3 (U). V-Formation Ambush.

5. In the "V" formation (Figure I-3), the attack force is deployed along both sides of the road where the kill zone is located so that it forms a "V"; care is taken to insure that neither group (or leg) fires into the other. This formation subjects the target to both enfilading and interlocking fire. This formation is best suited for open terrain but can also be used in the jungle. Its main advantage is that it is difficult for the target to detect the ambush until well into the kill zone.

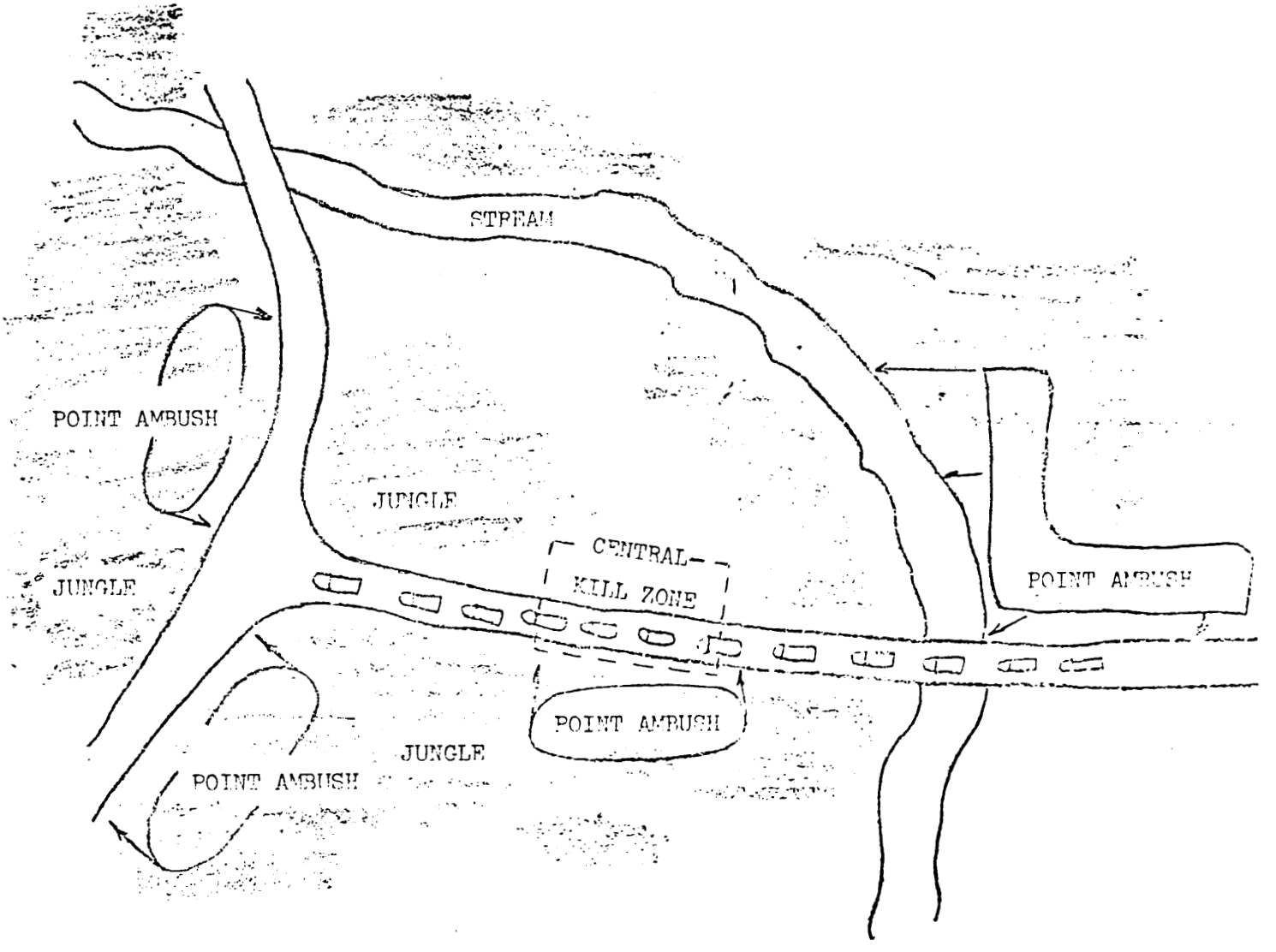


FIGURE I-4 (U). Area Ambush.

6. In the area ambush (Figure I-4) guerrilla forces may establish an ambush along a frequently traveled road. Point ambushes are established with the ambush area, along roads or other escape routes, leading away from the central kill zone. The ambush is initiated when the target moves into the central kill zone. When the targets break contact and attempt to disperse, escaping personnel and vehicles are intercepted and destroyed by the outer ambush points.

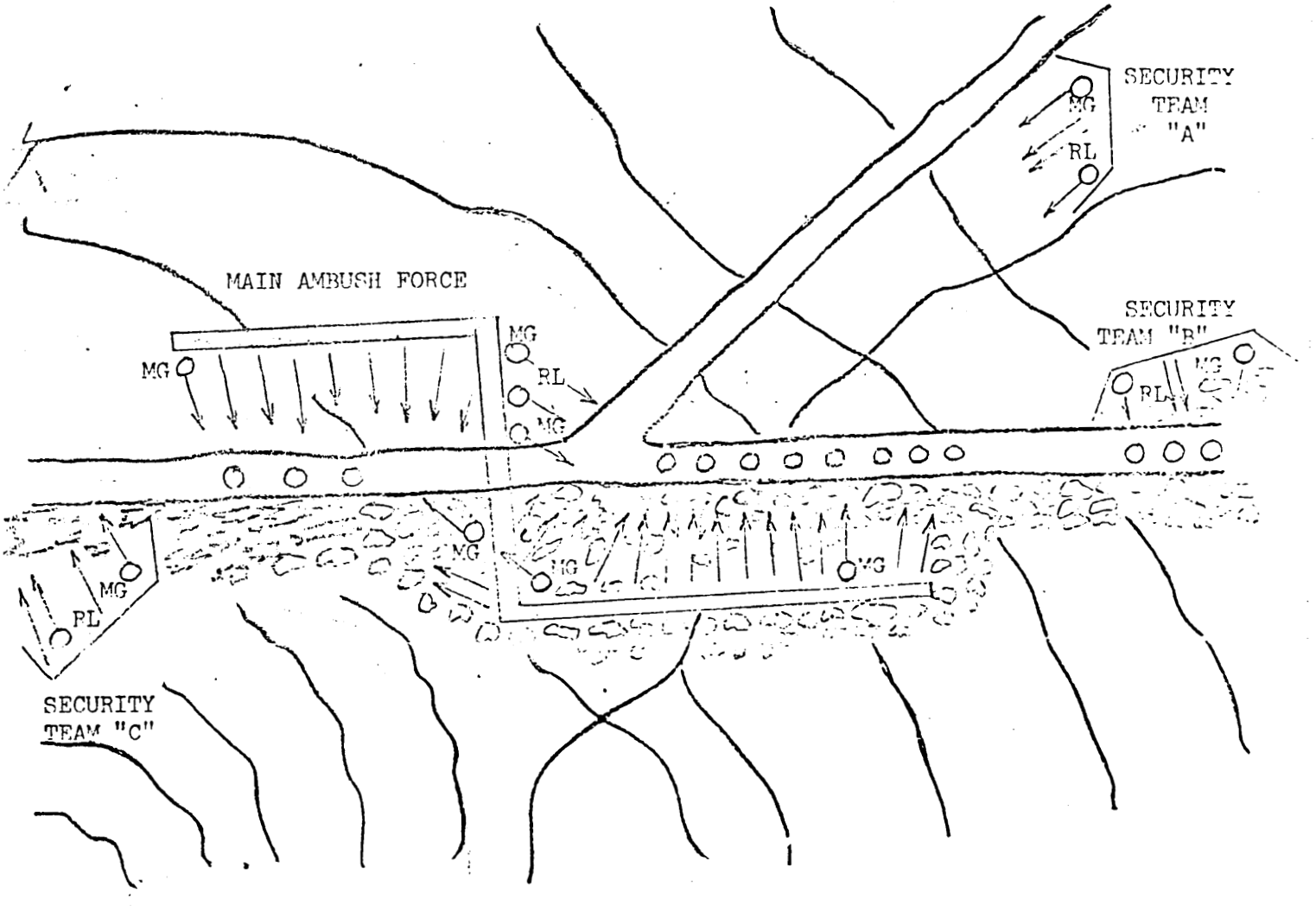


FIGURE I-5 (U). Z-Formation Ambush.

7. Three kill zones are established in the "Z" formation (Figure I-5). In addition, reaction forces can be prevented or delayed from reaching the target under attack. The "Z" formation lacks maneuverability and requires a large, well organized force.

DO NOT FILL IN THESE BLOCKS

INCIDENT

UNIT

**If possible, report in REMARKS: type fuze, type ammo(HE, WP, etc.), caliber, and Lot Number if UXO.

1. Pressure
2. Pressure release
3. Pull
4. Tension Release
5. Command Electric
6. Command Pull
7. Pressure Electric
8. Tripwire
9. Time Delay--- Note in REMARKS: Chem, Elec, or Mechanical

For Vehicle Incidents ONLY --- Leave BLANK If Not Applicable

1. 1/4 Ton
2. 3/4 Ton
3. 2½ Ton
4. 5 Ton
5. APC
6. Tank
7. Bus
9. Other*

1. Light (operational)
2. Moderate (org maint)
3. Heavy (spt maint)
4. Destroyed

1 2 3 4 5 6 7 8 9

Road or Trail

Top View

Wheeled Vehicle

Tracked Vehicle

KIA WIA
CASUALTIES

Has this area been mined frequently?
1. Yes
2. No

Was this a likely area for mining?
1. Yes
2. No

REMARKS

MACV Form 54 (13 July 69)

INSTRUCTIONS for Completing Front Side of MINE/BOOBY TRAP REPORT

1. The first line MUST be completed. Blocks 1 - 19 and 26 should be filled in. Blocks 20 - 25 will be filled in by CMEC personnel, but the individual completing this report must write in the name of the PROVINCE and his UNIT designation on the lines provided.

2. Blocks 27 - 43 if UNKNOWN or NOT APPLICABLE should be left blank.

3. Blocks 3 and 4 should be completed using two digit numbers corresponding to the month of the year. For example: 01 for JAN, 02 for FEB, etc.

4. Blocks 5 and 6 should be completed using two digit numbers corresponding to the day of the month.

5. Blocks 11 through 18 should show a two letter, six digit grid coordinate. For example:

Y	S	6	3	4	2	4	5

If only a four digit coordinate is known, the third and sixth digits should be entered as zero. For example:

Y	S	6	3	0	2	4	0

6. Blocks 38 through 41 must be completed. If there were no casualties, zeros should be entered.

7. The REMARKS blocks should normally be used only to amplify information in blocks 27, 28, 29, or 32. The remarks should be prefaced with the item number. For example:

44 … 80

2	8	-	B	I	C	Y	C	L	E		3	2	-	M	E	C	H	A	N	I	C	A	L													

SKETCH or PHOTOGRAPHY of:
1. Device, wires etc. and their relation to ground level.
2. Location of device in relation to personnel, terrain, manmade features. If a road incident, indicate width, surface material, and condition of road.
3. VC/NVA Warning Indicators in the area.

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13. ABSTRACT

An evaluation of vehicle convoy operations in the Republic of Vietnam (RVN) was conducted by the Army Concept Team in Vietnam during the period December 1970 through March 1971. The purpose of this evaluation was to study and analyze the organization and procedures employed in vehicle convoy operations by the US Army in the Republic of Vietnam and to determine whether or not applicable doctrine was being followed. Conclusions drawn from this evaluation were that: (1) transportation units did not possess the capability to perform proper vehicle maintenance and to meet convoy requirements; (2) transportation units did not have adequate organic security vehicles; (3) land clearing, road paving, and aviation support provided effective means of countering the ambush threat; (4) personnel and equipment losses due to mines posed a major problem; (5) in general, applicable doctrine was followed. ACTIV recommends that: (1) the vehicle maintenance capability of transportation units involved with convoy operations be strengthened; (2) an armored car, or like vehicle, with multiple weapons systems, be developed specifically to provide convoy security, and that it be organic to units concerned.

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